APR 17 1923
Chemical Library
APR 17 1923

GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

VOL. CLXII. No. 3125.] LONDON, APRIL 4, 1923. [75TH YEAR. PRICE 1s.

OXIDE OF IRON
SPENT OXIDE

GAS PURIFICATION AND CHEMICAL CO., Ltd.
PALMERSTON HOUSE, LONDON, E.C.2.
Telegrams: "PURIFICATION, LONDON."
Telephone: 9144 LONDON WALL.

PUMPING ENGINES
All Types for ACID, &c.
CAST-IRON OR STEEL TANKS
Any Capacity.
CHEMICAL PLANT.
Roofs and Girders. Structural Work.
SULPHATE OF AMMONIA PLANT
Air and Gas Compressors.
MIXERS.
TAR STILLS AND CONDENSERS.
W. NEILL & SON, Ld.
Engineers, Iron & Brass Founders,
ST. HELENS JUNCTION.
Telegrams: 'NEILL, ST. HELENS.' Telephone No. 20.

"Ask Berk"
SULPHURIC ACID
(Made from Spent Oxide)
FOR
SULPHATE MAKING
F. W. BERK & CO., LTD.,
1, Fenchurch Avenue, E.C.3
Abbey Mills Chemical Works, Stratford.
Pentre poth Chemical Works, Morriston.

"TORBAY PAINT"
FOR ALL PURPOSES.
The TORBAY PAINT CO.,
26/28, Billiter St., LONDON, E.C.
51, Old Hall St., LIVERPOOL.

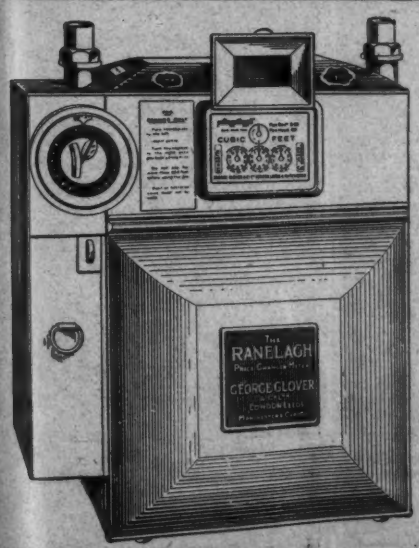
"BLUEBELL"
SILICA RETORTS
(95% SILICA)
John G. Stein & Co., Ltd.,
Castlecary, SCOTLAND.

Telephones: 1956 VICTORIA. 1957 Do.
Telegrams: "GASIFICATION, Sowest, LONDON."
WALTER MOORE & SONS,
GAS COAL & COKE CONTRACTORS.
72, VICTORIA STREET,
LONDON, S.W. 1.

W. & B. COWAN
(Incorporated in Parkinson and W. & B. Cowan, Ltd.),
LONDON. MANCHESTER. EDINBURGH. GLASGOW.
SYDNEY. MELBOURNE. BRISBANE. WELLINGTON, N.Z.
(See Advertisement on p. iii. of Wrapper.)

JAMES McKELVIE & CO.
Coal Owners,
Gas and Steam Coal Contractors,
17, RUTLAND SQUARE, EDINBURGH.
59, MARK LANE, LONDON, E.C.
GUILDHALL CHAMBERS, SANDHILL, NEWCASTLE-ON-TYNE.
24, CHAPEL STREET, LIVERPOOL.
ESTABLISHED 1840.

STEWARTS AND LLOYDS, LIMITED, 41, OSWALD STREET, GLASGOW. BROAD STREET CHAMBERS, BIRMINGHAM.
TUBES & FITTINGS for Gas, Steam, Water, &c.



George Glover's New
"Ranelagh"
Price-changer Pre-payment Gas Meter
can be supplied in the new
STANDARD SIZES
GEORGE GLOVER & Co., LTD.
Ranelagh Works, Royal Avenue, Chelsea, London, S.W.3.
Branches: 74, Diamond Street, Cardiff;
Ranelagh Meter Works, East Park View, Leeds;
City Meter Works, Port Street, Manchester.

Reduce your Maintenance Costs by using "FERRODOR" ELASTIC PAINT It is the cheapest because it lasts twice as long as other Paints.
GRIFFITHS BROS. & CO. (LONDON), LTD. BERMONDSEY, LONDON, S.E. 16.

SOME of the largest roof spans have been constructed by the Horseley Company, for example, Paddington Station Roof (1000 tons), Folkestone Station (4000 tons), Beckton Gas-Works (4000 tons); whilst our connection with the gas industry dates back to the earliest days when we constructed many of the first gas-holders erected in this country. Our progress has pursued an eventful course in the engineering industry as the use of iron and steel increased, and to-day we are able to offer customers the benefit of our unrivalled experience in constructional work of all kinds.

HORSELEY

BRIDGE & ENGINEERING Co LTD
TIPTON · STAFFS · ENG·

The firm with a hundred years experience to rely upon.~~~

This large roof span (weight 4000 tons) over the Purifier House of the Beckton Gas-Works was constructed and erected by the Horseley Company.

B DONKIN D

GAS METER REGULATOR.

CHEAP. EFFICIENT. RELIABLE.

This is a specially light, cheap, and efficient type of Regulator, screwed for W.I. connection, with removable top cover for adjusting outlet pressure.

CONSTANT PRESSURE MAINTAINED.

KEEPS LIGHTS REGULAR

SAVES GAS BY PREVENTING WASTE.

EASY TO FIT.

Fig. 669.

These Regulators are suitable for inlet pressures not exceeding 8" water pressure, the outlet pressures being adjustable from 1" to 3½".

State size of screwing required.

Adapters can be supplied to suit lead pipe if required.

SUITABLE FOR CHURCHES, HALLS, FACTORIES, SHOPS, WORKSHOPS, HOUSES, AND WHEREVER GAS IS USED.

SENT ON TRIAL—TRY ONE.

Thousands Supplied.

We also supply Regulators for Gas Services, Gas Fires, Stoves, and Street Lamps.

The Adoption of Gas Governors was Strongly Recommended at the Gas Therm Inquiry on Tuesday, January 9.

THE BRYAN DONKIN CO., LTD.,

Engineers, CHESTERFIELD.

B CHESTERFIELD D

GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

PROPRIETORS: WALTER KING, LIMITED OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

Telephone: Holborn 6857. —— Telegrams: "GASKING, FLEET, LONDON."

VOL. CLXII., No. 3125.] WEDNESDAY, APRIL 4, 1923. [75TH YEAR.

EDITORIAL NOTES.

Tar Market Quotations.

As was recently intimated in the "JOURNAL," we have had considerable difficulty lately over the wide differences there have been between the quotations of our bye-products market correspondents. The trouble chiefly centred round the prices that were given by "A Market Correspondent;" and we have been at some pains to try to discover the reason for this. In this there has been success. It seems that this particular correspondent has in some respects been quoting certain buyers' offers, and not the prices at which business has been actually done. In view of this, we have now discontinued our relations with that correspondent; and reports from him will not henceforth appear in our columns. This being so, we suggest that the prices which have appeared in his communications should be regarded as both unreliable and unrepresentative. We deeply regret any inconvenience to which readers may have been put through his figures not actually portraying the current trend and general position of the markets.

National Economy and Scientific Research.

THERE will be general regret in the industries of the country that it has been considered, and effect has been given to the view, that the national fiscal conditions are such that it is necessary to economize in the matter of scientific research. This is one of the last directions in which there should be curtailment of expenditure, so long as the research is being carried on with approved efficiency. The prosecution of research which will be beneficial to the industries and so to the nation should be continued with the vigour and fullness which are necessary to progressive prosperity—in fact, the heavy burden of debt that there is upon the nation today demands that the revenue potentiality of the industries of the country should be cultivated to the utmost possible extent. It is said, in extenuation of the retrenchment, that the allocation of the available funds should enable the immediately essential work in hand to be maintained. But what is "essential" work in connection with research? No one can really define it. Research seeks an issue; if the issue could be foretold, there would be no need for research. In its course, it may reveal new lines of investigation, which may be highly important, and therefore should be pursued. One can very readily limit expenditure on research, but one cannot with any degree of assurance assert of research in progress that so much will be essential, and that there will be nothing beyond which can be so described. We are sorry. As a nation we are spending less on research than the two great industrially competing countries—America and Germany. As to the amount of the reduction that has been made, we have not the exact figure before us at the time of writing; but whatever the reduction, in our opinion it is a movement in the wrong direction. For the Department of Scientific and Industrial Research, the aggregate net estimate amounts to £276,163—a decrease of £20,574. We will not refer to all the items of decrease; but it is noticed that the estimate for the year for the Fuel Research Board is £34,560, which is a reduction of no less than £16,819. The estimate for the National Physical Laboratory is £164,060—a reduction of £20,243. More than half the reduction in the estimate for the Fuel Research Board is in respect of salaries and allowances; but the provision for experimental plant, materials, and stores is reduced from £15,260 to £9000, and for investigations other than at the station from £5580 to £3500. With one or two exceptions, the annual grants to scientific and other societies remain at the same figure as in 1922-3; but the grant to the Mineral Resources Bureau is to be reduced by £1000, to £7750. The fuel-using industries will regret the curtailment that will be necessary in the amount of work at the Fuel Research Station—work which it was hoped would be developed, and not curbed to smaller dimensions than it has been. There is much to be done in connection with well-directed research into the efficient utilization of our fuel resources—the fruits of which research mean national economy and profit, which has a cumulative value far exceeding the expenditure in its realization.

The Doctor's Two Prescriptions.

THERE are probably more people who suffer and die annually through the effects of the impurity of the atmosphere than from the carbon monoxide in town gas (of which it is a valuable heating constituent), and not one of the number is a suicide. As in the case of carbon monoxide, so in connection with smoke abatement, Dr. W. A. Bone does not think much of the constitution of the Committee who considered the question. That was Lord Newton's Committee. According to a statement made by Prof. Bone to a representative of "The Times" last Wednesday, that Committee had not sufficient first-hand knowledge of the subject with which they were called upon to deal. Their report was lacking in constructive thought and outlook, and could not be accepted as embodying the best-informed opinion on the question in the country. Apparently the Government or Government Departments are woefully unfortunate in their choice of Committees—anyway, so Prof. Bone obviously thinks. In the case of carbon monoxide, he has prescribed immediate further inquiry, and restricting legislation. In the case of smoke abatement, he deprecates legislation until the industrial side of the question has been more thoroughly surveyed. "I think," he says, "it is more important to give "industry a fair chance to get on its legs again than to be "legislating for smoke abatement." This is a very good argument; but Prof. Bone does not appear to be consistent in its application—at any rate, his attitude towards the gas industry on the carbon monoxide question leads to that conclusion. He hopes that legislation in respect of smoke abatement will be postponed for three to five years.

A further suggestion is that the Ministry of Health should take powers (if not already possessed of them) to appoint an Advisory Board, composed of persons having special experience of the nature of coal and its combustion, industrial heating operations, and the varying conditions in different industries, and generally with a wide range of the practice which is comprised in modern fuel technology. The functions of the Board should include the investigation scientifically and technically of the means and possibilities of smoke abatement in boiler practice, and in various industrial operations, with a view to advising manufacturers and public authorities as to the most practicable steps that can be taken actually to abate smoke in such operations, and at the same time to conserve and economize fuel, having regard to the necessary conditions under which particular operations can be carried out. The Board could also stand in a kind of judicial position between the manufacturers and the public authorities.

That is generally the scheme for dealing with industrial smoke abatement, upon which Prof. Bone expatiated to the

representative of "The Times." There were two considerations not touched upon in his scheme. The first is that the duty of the Government, if they thought the scheme desirable, would be not to set-up an entirely new body, but to make use of their present resources. There is the Fuel Research Board, with an experimental station and plant already in existence, who could undertake all the investigation required. But unfortunately for the scheme in any form, the Government have been applying the pruning-knife all round national expenditure on research; and the industrial section of it (together with the work of the Fuel Research Board) has suffered curtailment in the operation. Prof. Bone may therefore rest assured that the Government are not likely at present to engage in any fresh commitments in this direction—though never such a good case had been made out to show that the expenditure would be but a tithe of the savings which our industries would effect, and which would therefore be of national importance. Without all the machinery that Prof. Bone suggests, much could at once be done by industry in the utilization of gas and coke—the advantages of both of which have been so widely proved by application to boiler-firing—and gas is making good headway in furnace heating and other industrial operations. But one of the idiosyncrasies of industry (speaking generally) is that it will rarely, while trade is bad, spend money on improvements that would enable it to function better when there is a return to normal or better times. Good demand, large production, and healthy prices have a wonderfully stimulating effect upon manufacturers in considering schemes for higher standards in, and more economical, working. It is the prospect of legislation which will hasten industry's movements in smoke abatement that has caused so much agitation among manufacturers, and has brought Prof. Bone to the front as their champion in opposition. At the same time, we too are utterly opposed to legislation that is practically inapplicable. Variable manufacturing conditions cannot all be brought under one inflexible form of regulation. But in every quarter of industry something could be done, and should be done, to assuage the pestilential conditions to which smoke gives rise.

Thermal and Domestic Efficiency in Cooking.

Neglected over a great number of years, the gas-cooker is now the subject of concentrated investigation, with the object of improving both its thermal and domestic efficiency. Until attention is particularly directed to the diverse character of the work that a gas-cooker, in oven and on hotplate, has to perform, to the considerable variations of temperature required, and so forth, it does not occur to many of us that the circumstances are so complex that, to effect improvement, a very searching investigation must be made, and that ingenuity and experiment of no mean order must be brought to bear upon it. This has never been emphasized in stronger manner than was done by Dr. Harold Hartley, Chief Chemist of Radiation, Ltd., in the paper (recently read by him before the Midland Junior Association) on "Developments in Gas-Cookers." The old-time cooker was designed without much, if any, consideration for the work to be accomplished, and with no eye on thermal efficiency. The work had to fit the cooker, and not the cooker the work, which is a vast distinction. That is being reversed with advantage; and now we see that those who design and make gas-cookers have been going back to where the start ought originally to have been made—that is, by studying the widely varying characteristics of the food to be cooked, and how best, having in view economy and efficiency both in respect of food and fuel, the requirements can be met. Dr. Hartley showed in his paper that this has been the starting-point in working-out the features of the "New World" cooker, and that the exploration involved has been extensive. The work has been in the hands of several experimenters; and to its results the collated experience of the several constituent firms of Radiation, Ltd., has been applied.

The paper shows that, having obtained a good grasp of needs in respect of food, consideration was given as to how best to meet them, with the nearest possible approach to maximum thermal and maximum domestic efficiency, and yet produce a cooker which would commend itself in regard to first and maintenance costs. The introduction of a deliberate consideration of domestic efficiency is very interesting. There has been much talk of the thermal efficiency of the cooker. In that we have taken part. It is an outstanding consideration; but we recognize in "domestic efficiency" a companion of equal account. In fact, Dr. Hartley describes it as the most important object of all; nevertheless, it has probably received less attention than the other considerations which combine to make a cooker what it should be. There is little need to describe what is meant by the factor of "domestic efficiency" in the construction of a cooker. It simply means the production of appliances specially adapted to provide the best conditions for performing the work for which they are intended; and this incorporates the simplest and most reliable methods of operation. It may almost savour of the paradoxical, and yet it is true that the attainment of maximum thermal efficiency and maximum domestic efficiency may often be diametrically opposed; and therefore, if a compromise has to be effected which reduces somewhat the one or the other below the otherwise realizable efficiency, then due allowance must be made for it on the ground of practical expediency. For instance, while one gets a larger hotplate thermal efficiency with the open cast-grid top, one cannot get away from the fact that this will require more careful treatment than the wrought-iron bars, which intersect flames, and cause waste by heat conduction. But the saving is worth the risk.

Here again one gets a point that should not be overlooked. An open cast grid will improve the efficiency of the hotplate; but one must not take it that an open cast grid alone constitutes a high standard efficiency hotplate. It is only one of the factors in improving efficiency. The burners themselves play an important part in both thermal and domestic efficiency. They should have a capacity for adjustment between a quick boiling and a simmering heat; but with the same burner one cannot ordinarily expect, unless special provision is made, to maintain a uniform, or approximately uniform, thermal efficiency between the two extremes of cooking requirement. In the new cooker burner, there is found provision for combining both thermal and cooking efficiency. The burners, it is mentioned in the paper, are adjusted to enable half-a-gallon of water to be boiled in from ten to twelve minutes; and taps are provided to allow regulation to simmering conditions or to stewing consumption. The provision of these devices is regarded as a most important contribution to both thermal and domestic efficiency. We will not deal with the controversial point as to drilled or large-flame burners; but here we have assurance that while the pre-war thermal efficiency of the hotplate was in the neighbourhood of 40 p.ct., the thermal efficiency with the new hotplate design and equipment is approximately 60 p.ct. This is a material stride in the upward direction. Another feature is that a reasonable consumption has been set for rapid boiling operations, with an eye upon the losses that arise through negligence in domestic use. These losses are kept as low as possible by setting a limit to maximum consumption. In other words, the time factor has been partially sacrificed to reduced consumption.

The parallel development of thermal and domestic efficiency has also been the objective in respect of the oven. Losses of heat occur through the walls of an oven, and particularly by way of the flue. The investigation of the chemistry and physics of cooking resulted in the view that a decrease in the excess air passing through the oven would tend to improve the cooking results; and this excess air has proved quite amenable to restraint, with the result that, whereas in the flue products of the ordinary gas-oven (so much air passing through) the carbon dioxide content is only 1 to 2 p.ct., it is 8 to 10 p.ct. with the new oven, according to the conditions of use. Both the thermal and the cooking efficiency have been increased; the former now being such that, it is said, a saving of something like 25 p.ct. has resulted in gas consumption. Conditions that were resolved upon and attained were that the consumption should be limited to 10,000 B.Th.U. per hour, and that, starting cold, a temperature of 400° Fahr. should be attainable in ten minutes. The question may be asked whether this would be realizable in all conditions of atmospheric temperature. Another point (also attained) is that the flames should burn satisfactorily under all ordinary variations of pressure; and a further one that the temperature variations in any part of the oven should be so small that there should be no necessity to move foods from one position to another. In this connection, there will be considerable interest in the "Regulo" heat controller for the oven, which should enable cooking operations to be carried on without the need for any considerable supervision. This controller has a graduated

head, capable of rotation, and is divided into three main zones—"hot," "medium," and "cool." It enables a variation of the temperature of the oven by no less than 360° Fahr.; and with it variations of pressure between 15-10ths and 60-10ths have little effect upon temperatures and consumptions. In short, the device, the paper informs us, enables given conditions to be obtained and maintained from day to day; and thus the demands upon the attention of the cook are reduced to a minimum.

Whether everything claimed in the paper will be proved in domestic service remains for the decision of kitchen and not laboratory tests, which have not the same alignment in their details. But sufficient has been said to show that investigation and practical knowledge are fashioning gas-cookers on scientific principles to the promotion of both thermal and domestic efficiency, which will materially contribute to household economy, and to the still greater popularity of gas as a fuel.

Architects and the Electrical Engineers.

THE Institution of Electrical Engineers and the Royal Institute of British Architects have had a joint meeting and discussion, with the view of promoting a closer alliance between the two professions—the electrical objective being the commercial one of getting the architectural profession to recommend to their clients the application of electricity whenever and wherever possible. But in order to do this without treading the paths of erroneous advice, architects must have a more intimate knowledge of the applications of electricity, and of performances and cost; and to ensure proper installation, they must have recourse to the expert knowledge and advice of electrical engineers. In making recommendations, however, they must be sure of their ground as to performance; and not only so, but in the interests of their clients they must also be reliably instructed as to the results that are achieved by competing agents. It would not be to their credit if, after giving advice, a client was disappointed, and charged their adviser with having counselled something that was more expensive and less serviceable than other means of doing the same work. If there is to be closer co-operation between the electrical and the architectural professions, then there must also be the same co-operation between gas and the architectural professions.

There were two papers read at the conference. One was by Mr. Francis Hooper, F.R.I.B.A., and the other was by Mr. J. W. Beauchamp, the Director of the Electrical Development Association. The abstract which we have before us of Mr. Hooper's paper contains so much complaint as to defects in the application of electricity that architects might well wonder whether the electrical profession has up to now demonstrated its capacity for taking up the rôle of collaborators; and in the paper by Mr. Beauchamp, he makes certain comparisons between gas and electricity which show that he is not up-to-date concerning the efficiencies of modern gas appliances, which are the ones that any self-respecting architect would recommend should be adopted, and not second-hand ones—the products of bygone times, and therefore much less efficient than those of modern birth. Mr. Hooper acknowledged the indebtedness of the community to engineers; but he went on to speak of the generation of electricity, and of the desirability of regarding as only temporary for that purpose the present dependence upon coal. He proceeded to refer to the glare of electric lamps. "Too often excessive candle power "dazzles, irritates, and injures the eye and the brain alike." In this and correlated matters, the author considered that public opinion needs educating. But whose fault is it that public opinion has not been sufficiently or better educated? If that question is considered by architects, it will be found that those who are seeking collaboration with them are not altogether blameless. In every supply area—in private houses, business establishments, and shops—are to be found in abundance electric lamps fitted and used in such ill-conditioned fashion that the high intrinsic brilliance of their filaments cannot avoid doing mischief. If electrical engineers did their duty, and emphatically warned users against the harm of such highly incandescent filaments without being shielded by suitable glassware, there would soon be a large suppression of the evil. Why they do not do this may be traceable to the supremacy of self-interest in the struggle between it and responsibility to the public. Mr. Hooper recognizes by reference that the principles of scientific illumination are well known, if not consistently practised, and that they are not so practised in the home, in public buildings, and business establishments is shown by his paper. As to heating, he is not blind to the economic aspect. He said in the presence of the electricians: "Electric radiators and cooking appliances are presenting "opportunities to the architect *where electrical energy can be "obtained economically*." But he urged a point to which electrical engineers do not care to listen when electricity as a heating agent is under consideration. It is that of ventilation. He pointed out that neither the architect nor the engineer should lose sight of the fact that electric radiators and cooking appliances do not provide automatically for the essential change of air in apartments in which they are used, as is the case with the coal fire—and we may add the gas-fire. All that the electricity industry can offer in the way of compensation is an additional accessory in the shape of an electric fan. Touching this matter, the interesting point was made by Mr. Hooper that "the connection between "ventilation and the study of sound may be less remote "than is commonly supposed, for acoustic defects are re-"ported to have been overcome by improved ventilation of "buildings." It was noticed that the author in speaking of co-operation referred to the "architect and the engineer." It was just as well perhaps he did not designate "electrical" engineers as the only species with whom there could be, or should be, co-operation. Other engineers have something to offer which is valuable to completeness in the work of the architect, and to efficiency in the results.

The paper by Mr. Beauchamp was really a two-part one. On the one hand it advocated the closest collaboration between the architect, the electrical contractor, and the illuminating expert, and on the other hand it pleaded for careful consideration of fuel and electricity in the dwellings of the middle classes—"our great prospect," according to the author's vision; and in this connection comparisons were made between electricity and gas. From what is said, it seems that electricity consumers are easily satisfied. According to our friend, electric lighting gives "satisfaction" at all rates up to 10d. or 1s. per unit; and for occasional or short-hour heating, and for regular all-the-year cookery, rates of 1d. to 2d. per unit, against gas at 4s. to 5s. per 1000 c.ft. ("usual calorific values," whatever that means), also gives "satisfaction." Mr. Beauchamp, occupying the position he does, ought, in our opinion, to have dealt with the matter in a fairer way than he did. In the first place, he knows, or ought to know, that the greater proportion of gas supplied in the country does not to-day cost 4s. to 5s. per 1000 c.ft.; and as each gas undertaking working under the Gas Regulation Act is now allowed to declare the calorific power of its gas, and in different supply areas calorific powers range from 350 B.Th.U. up to 560 B.Th.U. per cubic foot, it would have been better to quote the price at per therm. This would have shown that in the London area, at 9d. per therm, 11,111 B.Th.U. are supplied for a penny. Modern gas-fires, such as architects would naturally recommend, give not 40 to 60 p.ct. efficiency, as wrongly asserted by Mr. Beauchamp, but at least 75 p.ct. efficiency, which means that every penny supplies 8330 B.Th.U. as effective heat to a room. Even at 60 p.ct., the effective heat transmitted to a room would be 6660 B.Th.U. Electricity for heating purposes is not at the price of 1d. per unit in many places; but we will take the figure, and even utilize Mr. Beauchamp's 100 p.ct. efficiency, which means that the effective heat would be 3420 B.Th.U., as compared with the 8330 B.Th.U. for a penny with gas at 9d. per therm. What do architects think of that? Besides, electricity for heating uses does not stand much chance of descending below 1d. per unit, while gas is expected to make good recession from 9d. per therm, and has already done so in places favoured in respect of the availability of coal, or with low capital accounts in relation to output. We deny, too, the accuracy of the author's efficiency figures for modern gas ovens and hotplates, and challenge him to show that the boiling-plates of electric cookers have a life efficiency of 50 to 60 p.ct. Using his figure of only 40 p.ct. efficiency for a gas boiling-ring, with gas at 9d. per therm, the heat transmitted to the contents of the vessel would be 4440 B.Th.U. per pennyworth of gas; while 60 p.ct. of a unit of electricity at 1d. is only 2040 B.Th.U. We are not saying that Mr. Beauchamp deliberately set-out to deceive the architects. What we do say is that his efficiency figures do not apply to modern gas appliances, nor do his figures for the efficiencies of electrical cooking appliances apply throughout life. Further, if he sought to show that the efficiencies he ascribes to elec-

trical appliances mean better value to the users, then he signally failed.

This, we think, is a sufficient criticism of the figures to cause architects to question the wisdom of accepting *ex parte* statements, whether from the gas side or the electrical side. What we suggest should be done by architects, upon whom a large responsibility rests in their advisory capacity to clients, is well to examine prices in relation to thermal values, as well as efficiencies, under disinterested but competent direction. The testing resources of the gas industry we are sure would, if desired, be placed for this purpose at the disposal of the "R.I.B.A." There is confidence on our part that the gas industry would be satisfied with the results; and architects, having something reliable in their possession, would be able to proceed to counsel clients with more assurance than they can do now.

There is no doubt the electrical profession want to have things much their own way with the architects. Mr. Beauchamp suggested the formation of some permanent *liaison* between the architectural and electrical organizations —such as a Joint Committee drawn from the Councils of the several bodies, which would sit at intervals to examine and ventilate any proposals put forward by either side. The Committee could deal particularly with questions of policy or possibly propaganda between the two professions, and with questions as between, for example, the electricity supply industry, the architect, and the consumer. Out of the Committee, the author thought, might arise some method for instructing architectural students in electrical matters up to a certain point—giving a clear though perhaps superficial view of the conditions which govern the sale, purchase, and the use of electricity, and leading them to recognize the need for more detailed study of the subject. This all sounds very nice; but we are rather doubtful as to whether the architectural profession will want to encourage a too intimate relationship.

Gas for Industrial Purposes.

We recommend to the notice of gas salesmen in industrial areas where the heat-treatment of metals is daily in progress, the useful paper of Mr. J. M'Isaac, of the Glasgow Corporation Gas Department, which he recently read before the Glasgow and West of Scotland Association of Foreman Engineers and Draughtsmen. In it he brought into comparison the various fuels used for the purpose. Reading the first part of the paper (the chief features of which are reproduced in later columns), it almost looks as though town gas is hopelessly outdone by producer gas and coal in the matter of low costs per hour. But as the comparative case is further unfolded, it is seen that the final costs are the ones that matter; and in the total costs there is a complete reversion of the position—town gas coming out easily the cheapest, and the most speedy, class of fuel at present available for industrial use. Moreover, it offers advantages which are difficult to get with any other fuel. A design of furnace is possible which will give the highest efficiency under known methods of construction; perfect combustion can be secured within very close limits; equal distribution of heat can likewise be effected. Gas and air supplies are under absolute control, thus rendering it possible to create any atmosphere within the furnace chamber—neutral, oxidizing, or reducing atmospheres can readily be obtained; and changes of temperature can be made quickly. These are only some of the advantages. Mr. M'Isaac is a strong exponent of the virtues of town gas for manufacturing purposes; and Glasgow offers a good industrial field for exploitation. It is in such a field that a man must have a deep and broad knowledge of the technical applications of the fuel that he advocates; and he must know the limit of the advantages of the competitors, and where their disadvantages commence and end.

Verticals at Port Glasgow.

The members of the Western District of the Scottish Junior Gas Association have been visiting the Port Glasgow Gas-Works; and they were given by the Engineer (Mr. R. W. Cowie) some interesting details regarding the new works. The central feature of these is the Glover-West vertical retort-settings, with all the ancillary plant for handling materials. A table published with our report indicates that the changes effected will have a material influence on the fortunes of the undertaking, and to the advantage of the consumers. With steaming, 19,300 c.ft. of gas are now made, of a calorific value of 420 B.Th.U., which means 81·06 therms. The coke made for sale per ton is 6 cwt., tar 19 gallons, and sulphate of ammonia 40 lbs. Compare this with the old horizontal settings. The make of gas was 11,000 c.ft.; the coke made per ton was 7 cwt.; the tar 13 gallons; and sulphate of ammonia 21 lbs. The difference in coke is only 1 cwt. less, steaming notwithstanding; but *per contra*, there is the additional make of gas or therms, 6 gallons more tar, and 19 lbs. more sulphate of ammonia. The calorific value of the 11,000 c.ft. per ton of coal carbonized with the old horizontal retorts is not stated; but if we are as liberal in estimate as 550 B.Th.U., this would only give 60·5 therms per ton of coal, as compared with the 81·06 therms with the new retorts. The old retorts must have been very inefficient, as with them the net cost of gas into the holder during the three months ended February, 1921, averaged 33·57d. per 1000 c.ft., as against 6·55d. per 1000 c.ft. with the new retorts in the three months ended February, 1923. The low production of coke for sale also bears witness to inefficiency. Two points vitiate the comparison on the 1000 c.ft. basis. One is that the calorific power from the two systems is not the same per 1000 c.ft.; and the other that the cost of coal has considerably diminished. But making all allowance for these variations, the figures show that the difference is large between the net cost per therm under the old inefficient order of things and the net cost under the new efficient method. It would be better now if cost comparisons were always rendered on the therm basis. Then we should know exactly where we were.

Prof. Armstrong's Little Mistakes.

There appears to be a deliberate agreement between the professorial bearers of the banners of anti-industrial smoke-abatement legislation and the low-temperature carbonization schemes, to ignore the existence of the Fuel Research Board and the work upon which they are impartially engaged. They cry out for fresh Committees or Commissions to be brought into existence for this and that purpose. Prof. H. E. Armstrong now desires a competent body appointed to consider the fuel problem in all its bearings. This is found in one of his expositions (this time in the "Manchester Guardian") of a remarkable capacity for generalization and a general lack of commercial foresight. In the introduction of the article, he makes one or two slips in his haste to give vent to his views. He says fuel problems have again become prominent owing to a combination of circumstances—the high price of coal, the smoke abatement agitation, deaths from gas poisonings, suicides and accidents, due to the percentage of carbon monoxide in illuminating gas, as well as the therm agitation. Of course, it was an error to say that the number of deaths was "due" to the percentage of poisonous carbon monoxide in illuminating gas; for in some districts in which the gas contains the largest percentage of carbon monoxide, there have been no deaths from gas suicide or accidents; while in others where there is present a smaller percentage of carbon monoxide, there have been suicides or accidents. Perhaps where there is a high percentage of carbon monoxide, the fact that there are no deaths is attributable to the people themselves being generally more sensible than those in some other areas. In certain districts where there have been suicides or accidents, coal gas only is distributed. The deaths are not "due" to the percentage of carbon monoxide in the gas—all town gas contains some percentage. Broadly speaking, too, gas does not pretend to-day to be *per se* "illuminating" gas. This is later on acknowledged by Prof. Armstrong. Then why call it by a name which does not describe it? Even professors may, if they choose, discontinue to live forty years behind the times.

To Retrogress a Century.

Well, Prof. Armstrong is sure that no Departmental Committee or Royal Commission of the conventional character can deal with this great fuel problem. But as we dig deeper into the article, it seems to resolve itself, in the Professor's mind, into whether or not the gas industry shall produce smokeless solid fuel. Of course, it does that now; but not (so we are told) of the right quality, though nowadays the quality of gas coke is improving, and advantageous uses are found for it. However, the great question that is now coming to the fore, according to the Professor, is as to whether gas companies should not take under their charge the local production of a smokeless solid fuel suitable for general use. He works-up a case which ends in a reversion

from high-temperature to low-temperature carbonization; but he does not seem to mind the mixing of the rich gas with water gas (the percentage of carbon monoxide not then coming into consideration), in order that a coke of the properties he desires may be produced. He would like to see gas undertakings revert to the carbonizing practices of a century ago; and this would promptly mean the cessation of the flow of new capital into the gas industry, and probably an early inability to pay the interest upon the loan capital already in existence. Low-temperature carbonization may become an auxiliary to current gas-manufacturing operations (no one can speak positively as to that), but it will never displace them. In passing, approval is given by Prof. Armstrong to the therm. "The charge that is now made for gas, based upon its heating value, is not only rational, but the only method by which its value can be scientifically assessed;" but he thinks there is plenty of room for improvement in the character of the appliances by which gas is used.

Further Views.

However, the Professor says that, when the change was made to declared calorific value, it was at first thought that gas of low heating power might be produced more cheaply, and yet be satisfactory. In his view, gradually it is being discovered that this is not the case; and he thinks it probable that the example set by the South Metropolitan Gas Company will ultimately prevail, though at present very unpopular in the industry. We need not refer him to anything farther away than a previous paragraph on the Port Glasgow vertical retorts. But he is hopeful that low-calorific gas will create a distribution problem that will force gas undertakings to produce higher qualities, and that this will automatically lessen the percentage of carbon monoxide. And so we reach the professorial goal: "An early return to the old method of manufacture, by carbonizing at low temperature, is foreshadowed, as by this means a gas may be produced of high heating power, together with an easily combustible coke suitable for general use in place of coal. The smoke problem will be solved, and other great advantages would follow. . . . We only need to make use of our scientific knowledge." That is wrong. We have need to make use not only of our scientific knowledge, but of our practical experience. Where Prof. Armstrong always fails is in not telling us anything about the capital expenditure that would be required to carry on the low-temperature carbonization of the enormous quantity of coal which would be necessary to carry out his ideals, or to get the gaseous therms at present required. Nor does he give us any guarantee as to the public demand for the coke at the price that would have to be charged for it. Nor does he tell us what we are to do with those people who prefer gas for heating purposes, and so are gradually reducing the market for solid fuels. This is a matter in which science and commercial acumen require to be well blended. We fail to detect the blend in the writings of Prof. Armstrong on the subject of low-temperature carbonization, earnest as may be his belief in it.

Miners' Wages Agreement.

There has been a strong attempt, on the part of the miners in some districts, to end the present wages agreement in the coal industry; but it has not succeeded. It is a national agreement; but each district is now looking at the matter from its own economic position, and the hope of pay advances in the respective areas. Some of the leaders think that, if this attitude is continued, it will imperil the very existence of the Miners' Federation. In some of the more turbulent areas, the men would like to see the Federation use the termination of the wage agreement for taking more or less violent measures; but the Federation has not yet recovered its financial balance, nor has it or its constituent parts yet discharged the obligations resulting from the three months' strike in 1921. The terminating of the agreement was the subject of discussion at a Delegate Conference last Wednesday, when, by a majority of 133,000 votes, a resolution deferred any action until the delegates have reported fully to their districts on the subject. Meanwhile, the Executive of the Federation are to make a further effort to secure from the coalowners certain amendments to the agreement. The Parliamentary Labour Party are also to be asked to introduce legislation to amend the Coal Mines Minimum Wage Act, 1912, in order to provide for all mine workers "a wage equal to the cost of living." This, however, is not regarded as a sound proposition, inasmuch as the Act was passed with a view to giving a certain fixed daily allowance to piece-workers when operating in abnormal places, where they are unable to earn a living wage. This is not the same thing as fixing a statutory minimum wage for all men employed in and about the mines. It would open up a very big question—seeing that, if the proposed principle was statutorily conceded in the case of the miners, it would have to be granted in the case of all other industrial workers. Reverting to the wage agreement, it should not be overlooked that it contains a clause by which the men in any district can appeal to an independent Chairman to fix a subsistence wage, which is a charge upon the income of the industry. A not inconsiderable section of the Federation, too, are of opinion that the termination of the agreement is one for the determination of the men themselves, and not for a delegate conference. A final decision has therefore been deferred, in order that the whole position may be thoroughly explored.

Minerals and Support for Works.

Gas-works in mining areas have suffered not a little from subsidence through underground operations. There is a Bill now before Parliament known as the Mines (Working Facilities and Support) Bill, the object of which is to facilitate the working of minerals, and to impose restrictions on the working of minerals required for the support of railways, buildings, and works. The Bill has passed through the Committee stage in the Lords.

"Summer Time" Not for France.

The opponents in France of any alteration of the clock during the summer months have gained their way. It is now reported that representatives of the agricultural interests in the Chamber have proved so strong in their obstructive tactics that the Government have given up attempting its introduction. Now something else has happened. The Minister of Public Works has tabled a Bill which intends to make the official time of France no longer Greenwich time, but Strasbourg time. This being thirty minutes in advance of the former, it is hoped by this means to obtain some of the benefits of summer time. The idea is that Strasbourg time shall apply all the year round.

Absenteeism and Its Results.

In the second of two articles on "Managing Men," in the pages of the "Gas-Age Record," Mr. Floyd W. Parsons says that though industrial conditions are improving, the losses of the United States through ignorance in management are still something colossal. The nation's loss through absenteeism totals approximately $2,520,000,000 annually. This figure is arrived at by assuming that there are 300 working days; and the average amount of absenteeism is 7 p.ct., or 21 days each year. Continuing the calculation on the basis of 30 million workers, at an average wage of $4 a day, the total named is reached. But, he goes on, the evils of absenteeism are not all included in the mere monetary loss. The fact is that idleness is a demoralizing influence that decreases the efficiency of workers, and is an important cause of labour turnover. Steady employment is an acquired habit; and the workman who loses the habit of strict application to his job soon finds himself a member of that nomadic class of employees who are always seeking new fields of endeavour. It is, of course, understood that vacations are essential, so that the absenteeism referred to by the writer is only that unnecessary idleness that is not anticipated, and therefore leaves equipment and machinery unmanned. In such cases the employer has to bear an overhead expense with no return whatever. If a less competent workman takes the place of the absent employee, the result is a decreased output. When men work in groups, the absence of one individual will frequently decrease the efficiency of all those who stay on the job. Too many managements in need of greater production solve their problem by adding to their plant capacity, whereas it would be cheaper and easier to introduce methods that would increase individual output. Every undertaking should hold tenaciously to the policy that its purpose is to render useful service, rather than to extract the utmost profit. When the dominant motive in a concern is sheer profit-making, the sympathies and interest of the men will not be so strong as when the business is run under a rule of limited returns to capital.

American Gas Association Convention.—As the result of a canvass of the entire membership, it has been decided by the Special Committee appointed by the Executive Board that this year's convention of the American Gas Association is to be held in Atlantic City, during the week commencing Oct. 15. Next year's convention will take place in Chicago, and thereafter meetings will be held alternately in the East and the West.

PERSONAL.

Mr. Godfrey W. Kaye, who, since the death of Mr. F. A. Price, three years ago, has been Secretary of the Manchester Corporation Gas Department, and for several years earlier served in the same undertaking, was entertained at luncheon by his colleagues last Thursday. Mr. W. Newbigging (Consulting Engineer to the department) was in the chair. A day or two before, the Chairman of the department (Sir William Kay, J.P.), on behalf of the staff, presented Mr. and Mrs. Kaye with a silver tea and coffee service, as a mark of the esteem which all ranks in the department felt for him, and of their wishes for his success in the new sphere of work he is about to enter. Sir William Kay spoke highly of Mr. Kaye's efficient services in the past, and the good feeling which always pervades the gas department of Manchester. They were sorry to lose Mr. Kaye; but, at the same time, they congratulated him on his new appointment with Messrs. Sivewright, Bacon, & Co., shippers. Mr. Kaye, in appropriate words, expressed his deep appreciation of the kindly feelings evinced by the presentation and speeches.

On Tuesday of last week handsome gifts, comprising an up-to-date gas-cooker with a complete set of utensils, a sterling silver tea-service, and a case of cutlery, all suitably inscribed, were presented to Mr. B. W. Smith, who is retiring from the position of Engineer and Manager of the Walsall Corporation Gas Department, after 23 years' service. Mr. J. Holt, one of the oldest stokers, who presided, mentioned that during Mr. Smith's period of office the works had been practically reconstructed, and the employees had cause to be grateful for the amicable conditions which had existed under his management, and the honourable way in which he had always met them. Mr. W. H. Shelley, chief clerk of the fittings department, said that when Mr. Smith commenced his duties there he was confronted with many problems and difficulties; but he overcame them, and to-day they had works which were the envy of gas undertakings throughout the country. The presentation was made, on behalf of 120 employees, by Mr. H. Hands. In responding, Mr. Smith said nothing had given him greater pleasure than to work for the success of the undertaking.

The annual Bronze Medal of the International Metallurgical and Chemical Society has been awarded to Mr. G. E. Foxwell, M.Sc. (Lond.), Chief Chemist to the Koppers Coke-Oven Company, Ltd. Only one medal is awarded. This is international in character, and is given for the best thesis, invention, or discovery in connection with any chemical, metallurgical, or allied scientific investigation or advancement. Mr. Foxwell received the award for his theory of the path of travel of the gases in the coke-oven, and for his work on the thermal dissociation of ammonia.

The marriage took place at Linthorpe, Middlesbrough, last Wednesday, of Mr. Charles F. Blincoe, who has been for several years Manager of the Middlesbrough Corporation Gas-Works, and Miss M. L. Webb, R.R.C., ex-matron of the West Lane Hospital, Linthorpe. The bride was given away by Mr. P. Kitchen (Town Clerk); and the Mayor and Mayoress (Mr. and Mrs. S. A. Sadler) and several members of the Corporation were present. Later the Mayor proposed the health of the bride and bridegroom.

On Wednesday last, at the Richmond Gas-Works, a presentation was made to Mr. T. V. Johns, upon his leaving to take up the appointment of Gas-Works Manager at Lowestoft. The gift consisted of a set of gold-mounted pipes; and Mr. E. George Hutchinson, in making the presentation on behalf of the works and office staffs, said it was with mingled feelings that they had heard of Mr. Johns' promotion. At the same time, they wished him every success in his new sphere. Mr. Johns briefly replied, and referred to the many happy friendships he had made during his four years at Richmond.

Alderman Hubert Bewlay, M.Inst.C.E., has sent in his resignation as a member of the Birmingham City Council, owing to the state of his health. He has been on the Gas Committee since he joined the Council in 1911; and when his retirement was announced, the Gas Committee expressed their appreciation of his services to the department. Throughout his business life, Alderman Bewlay has been associated with the engineering firm of Messrs. Thos. Piggott and Co., Ltd., of Spring Hill, which he joined as an articled pupil, and of which for the last thirty years he has been a Director.

The Fixation of Nitrogen.—Mr. E. Kilburn Scott, Assoc.M. Inst.C.E., M.Inst.E.E., is giving a series of three Cantor Lectures at the Royal Society of Arts, on "The Fixation of Nitrogen." They will be delivered at 8 o'clock on Monday evenings, April 9, 16, and 23.

Suction Gas Producers.—In a paper which he read before the Manchester Association of Engineers, Mr. William Greenwood said there was every indication that the use of refuse fuel for gas production would become more extensive in future, owing to the cost and difficulty of disposing of this refuse by other means, as well as the increasing cost of better kinds of fuel. Although the results now obtained were very good, there would certainly be greater developments in future. Two of the materials in this category which he mentioned were spent tan and cotton seed husks.

ELECTRICITY SUPPLY MEMORANDA.

It has become quite a standing, but very poor, joke in the electrical papers to twit gas engineers respecting their use of electric power in gas-works, while advocating the employment by other people of gas-engines. Of course, this is a remarkably poor gibe; but if it was anything else, then it would be the best possible proof that the men who make the point do not know anything about the functions and duties of a genuine engineer. An engineer is a man who must not have his considerations and decisions guided and stunted by prejudice, but must in all cases apply the means to achieve an object which are most suitable—the most suitable not always being the most economical. The Presidential Address of Mr. Percy S. Hoyte to the Southern Association of Gas Engineers and Managers showed the considerable extent to which electrical operation at the Plymouth Gas-Works has supplanted steam power. It indicated, too, how the change has added to the efficiency of the works and has saved fuel; and it emphasized how a private plant can, with the load developed as at Plymouth, supply electrical energy for all purposes at an over-all cost which could not profitably be touched by the distributed energy from the local generating station. Nor could equal reliability be guaranteed; and reliability is highly important in such a case as the mechanical operation of a gas-works.

Cost of Generation at a Gas-Works.

The electrical power output of the Plymouth Gas-Works has increased from 213,000 B.H.P.-hours in 1911 to 812,000 B.H.P.-hours in 1922; and between seventy and eighty motors are now employed, as compared with six in 1911. The horse-power installed in 1911 was 80 B.H.P.: in January last, 823 B.H.P.; and soon there will be 1083 B.H.P. Three boilers on the works, which were used in 1910 to supply an annual output (with steam-engines) of about 200,000 B.H.P.-hours, now supply the annual load of 812,000 B.H.P.-hours, with a lower consumption of fuel. The cost of the power during the year ending March 31, 1922, delivered by the motor driving shafts worked-out at 1·11d. per B.H.P.-hour, including fuel (the coke breeze being charged at 10s. per ton), capital, and labour charges. The cost of the electrical power delivered at the dynamo switchboard works-out at 0·73d. per unit for the annual output of close on a million units. It is not often that one gets carefully recorded figures of the cost of works' generated electricity supply. Fuel and steam or gas is there for generating purposes; and so—it being regarded as sufficient to be self-dependent for electrical energy rather than rely upon an outside source—very close records are not kept as to costs. Of course, they ought to be. Anyway, here we have something definite upon which to go. Remembering that not a small proportion of the work is intermittent, what do electrical men think of the 0·73d. per unit at the switchboard, and the 1·11d. at the driving shafts, with capital and all else included? Could they do any better for a gas undertaking? We think not.

Heavy Oil Engine Costs.

Considering that these Plymouth figures are over-all ones—that is to say, including fuel, capital, and labour—they show as good a case as the Diesel heavy-oil engine. The working costs (for a period of five years) of various works were under discussion at a recent meeting of the Diesel Engine Users' Association. As seen above, at the Plymouth Gas-Works, the output now approaches 1 million units per annum; and in the compilation of the costs of six undertakings using heavy-oil Diesels, and having an output of a similar magnitude, and load factors of at least 15 p.ct., the total works cost was 1·08d. per unit in 1921, which, allowing for the reduction in the expenses of labour and materials, corresponds to a present-day average works' cost of 0·789d. per unit generated. In arriving at this figure, maintenance costs were taken as the average of five years. Taking the fuel cost alone of the six representative heavy-oil engine installations, it was seen to average 0·52d. per unit generated in 1917, 0·67d. in 1920, and 0·53d. in 1921. Working under the conditions referred to, the present-day average fuel-oil cost for Diesel engine installations is stated to be in the neighbourhood of 0·33d. per unit. But with Diesel engines, the fuel cost alone is a very unsafe figure upon which to place any reliance. It is the total figure which is important, and that total figure at the switchboard at the Plymouth Gas-Works was 0·73d. in the year ending March, 1922.

Electric Power and Industry.

There are people who on some subjects have but a single idea, and so are unable to examine those subjects in proper perspective, or from all aspects. The Electrical Development Association has held its annual luncheon; and the organizers succeeded in getting Lord Haldane there. He spoke upon industry and electrical power. One thing he said was quite to the point, though not conclusive for all works, where the generation of steam is an essential in the operations. Electrical power, he remarked, could do for manufacturing industries what could be effected by the wasteful steam-engine, but at a fraction of the cost. Then he stated that another important factor in the development of this idea was the appreciation of workmen that their own position would be immensely improved if there was an abundance of electrical power available at a cheap rate. That is one of the fallacies which get possession of some minds, and is

regarded as an all-powerful-truth. We do not for a moment deny the importance to industry of cheap power; but it is only one of several factors in industrial prosperity. When total works' costs are examined, it is found that the item of power does not represent such a wonderful percentage of the whole as is frequently imagined. The line of thought naturally suited those of the company present at the luncheon who are interested in industrial areas and supply—such as the President (Mr. W. B. Woodhouse, Engineer and Manager of the Yorkshire Electric Power Company). In his view, the greater the prosperity of the electricity industry, the more rapidly would its advantages be extended to other industries. It is only by reduced costs that electricity can be rendered cheaper; and on the experience gained by large generating stations in this country, what chances are there of KW.-hours at a substantially cheaper rate in industrial areas—even given pre-war costs for materials and labour, which will be a long time coming judging from the condition of things in the labour world to-day, and the resistance to a nearer approach to pre-war standards of pay? Another point made by Mr. Woodhouse is that the prosperity of the trade of the country generally means that the electricity industry must be made prosperous: but an essential to this is that there is ample working capital available. He applauded the work of the Electrical Development Association not only in the direction of the enlargement of the application of electric power in industry, but in connection with electric cooking. He admitted, however, that in this respect, in order that the development should be as widespread as possible, it is necessary to hire-out cooking apparatus. Even then, the cost of electric cooking is not a negligible one for the householder. The masses of the people cannot afford to do on a hired electric cooker what they can afford to do on a gas-cooker. One of the great mistakes electrical men conveniently make is to talk of the work of the oven of an electric-cooker as though this comprises the alpha and the omega of cooking operations. The oven has not such an inclusive range—much more is done on the hotplate than in the oven of a gas-cooker. Electrical men know this; but their business is to make the best they can of a bad job.

Prospects of Electric Lamp Developments.

It does not appear likely that there will be any startling developments upon present-day incandescent electric lamps. In a lecture recently delivered before the Association of Supervising Engineers by Mr. Bernard B. Dudding, of the General Electric Company, Ltd., he stated that little further progress can be expected with regard to the vacuum lamp; and the limiting factor of the gasfilled lamp was the mechanical strength of the wire at high temperature—in other words, its ability to support the filament. If there is one thing more than another that should be devoutly wished by people who have any consideration for eyesight, it is that the capacity of electric lamps in respect of the deterioration of the organs of vision should not exceed that which now exists. It would be a good thing if there was a reduction of that capacity rather than an increase.

Electric Cooker Hire Purchase to Contractors.

"Cooking and Heating Notes" in the "Electrical Times" give an interesting account of a hire-purchase scheme for electric cookers which has been instituted by the Carron Company, and has been particularly devised to meet the circumstances of contractors. The information is concisely given; and so we appropriate it. It is stated that the list price of the cooker is £19 10s., subject to the trade discount of 25 p.ct., and a further 5 p.ct. for cash monthly. Under the scheme, contractors are given extended credit for six months; the additional 5 p.ct. cash discount not, of course, being allowed in this case. A cash payment of 25 p.ct. of the net value of the cooker at the time of sale is required; the balance to be paid by the contractor six months after delivery. The terms of sale to the customer are £4 17s. 6d. with order, and twelve monthly instalments of £1 5s. 6d.; the cooker becoming the property of the consumer after the last payment has been made. The contractor buys the cooker from the Carron Company with two payments—one a cash settlement of £3 13s. 2d. with the order, and the balance, £10 19s. 6d., six months later. His first payment is more than covered by the customer's £4 17s. 6d.; while at the end of six months he will have received £12 10s. 6d., which is only about £2 2s. short of the total sum he must pay the makers. In a further two months, he more than recovers this from his customer; and all subsequent payments are net profit. To sell cookers under this scheme, therefore, the contractor has only to find out of his own pocket £2 2s. for two months (£1 5s. 6d. is only required for one month). As interest on the very brief investment, the contractor receives the difference between the total amount paid by the customer and the list cash price of the cooker—viz., £20 3s. 6d., less £19 10s.—that is, 13s. 6d. The cooker is fully guaranteed for one year. The development of electric cooker use seems to be a business that requires a great deal of effort and scheming put into it.

Over-Competition and Unqualified Men.

The gas industry is not alone in suffering from the recommendations and work of tradesmen outside the industry. They advise, but know little or nothing about the efficiency, economy, or life qualities of the appliances; and they instal, at cut prices, on the "cheap and nasty" principle. The matter has been under consideration by the Hull Corporation Electricity Committee; many complaints having been received by them as to the exposed wires in private houses. The Electrical Engineer states that not only in Hull, but throughout the country, unsatisfactory wiring has been, and is being, carried out by unqualified men. A reason for this is supplied by Hull, where there are about three times as many wiremen as there were before the war. Some of these men undertake to instal electric light much cheaper than is possible by any conscientious contractor. As a consequence, much bad workmanship results. But why do the electricity undertakings connect-up these installations if they do not comply with their rules and regulations? In the Electric Lighting (Clauses) Act, 1899, it is enacted that "the undertakers shall not be compelled to give a supply of energy to any premises unless they are reasonably satisfied that the electric lines, fittings, and apparatus therein are in good order and condition." If electricity undertakings would refuse supply in cases of defective and dangerous installation, householders would soon come to the conclusion that cheapness is not the sole matter that must receive their consideration. "Megohm," in the "Electrical Times," refers to the prevalence of "amateur" electricity installation; and in his comments, he remarks: "It is to be hoped that the fire-office inspectors are keeping their eyes open to detect work of this character; otherwise, we may have an epidemic of fires which will bring electric lighting into disrepute."

A New Tariff based on Lampholders!

A new two-part tariff has been introduced based on the number of lampholders in use. We are not sure who is the author of this; but anyway it has been adopted at Leicester under the advice of Mr. W. A. Gillott—a consultant on electrical trading matters. The fixed annual charge is calculated at the rate of 9s. per lampholder per annum; but the charge is limited to three-fourths the total number of lampholders fitted on the premises—the fixed charge being payable quarterly in equal amounts. In addition to the fixed payment, a rate of 1d. per unit is charged for all electricity consumed in the house, for whatever purpose. Under this system, it will be to the interest of consumers to cut-down as low as possible (say, by using large units instead of small) the number of lampholders in the house; it will be to the interest of suppliers of electricity to get installed as many lampholders as possible, so as to increase the fixed charge. Mr. Gillott quotes the case of a household of six persons—three adults and three children—to show how this works-out. There are fourteen lampholders in the house; and three-quarters being ten-and-a-half, the fixed charge at 9s. works out to £4 14s. 6d. per annum. The electrical energy consumed is: Lighting, 176 units; cooking, 2098 units; cleaning, ironing, and heating, 942 units—a total of 3216. The amount used for cleaning, ironing, and heating shows that precious little heating is done electrically. But the cost of the 3216 units amounts to £13 8s., which, with the fixed charge, makes £18 2s. 6d. This averages 1·35d. per unit for lighting and all else. Now if we separate the lighting units, and charge the remainder at 1d., they total to £12 13s. 4d., which would leave £5 9s. 2d. for the lighting units. This sum for the 176 lighting units works-out to 7·43d. per unit. Really the consumer is not getting much, if any, advantage from this seemingly cheap rate for units. Of course, one can see that little heating is done electrically—942 units would not go far in room heating, especially seeing that it includes "cleaning and ironing." We read that coal fires are only used in the kitchen and in the dining-room "during the evening"—all the "rest" of the heating is done electrically. We pity the residents in that house, if they, through electrical operation, are doomed to insufficient heat during the day, and merely have comfortable fires in the evening, and those in only two rooms. How in winter they must look forward to the evenings! However, the amount of coal used is 4 tons per annum. Reckoning this at 50s. per ton, there is £10 to add to the £18 2s. 6d. already paid for electricity. It would be interesting to know how, with one meter, Mr. Gillott was able to state with such precision the quantity of current used for lighting, that used for cooking, and that consumed for cleaning, ironing, and heating. Information is given, too, that in the Leicester housing scheme electricity is being used for lighting and cooking, and the supply is given through shilling-in-the-slot meters. It is found that, for an average household of approximately four persons, the weekly cost is 3s. to 3s. 6d. per week. "Therefore," it is said, "the full convenience of the electric method is brought within the means of the average working man." An average of 3s. is £7 16s. per annum, and of 3s. 6d. £9 2s., without any heating. We should want more details before being in a position to pass judgment upon these figures. If a unit per person per day is a fair expenditure for "cooking," with four persons in a family (five is the usual reckoning), in twelve months 1460 units would be needed; at 1d. per unit, this would total to £6 1s. 8d. If an average of 3s. per week is put into the slot meter, only £1 14s. 4d. would remain for the year's lighting! Who pays for the installation, the meter, and the total cost of delivering the current to the consumer's terminals? More explanation is needed.

Scottish Junior Gas Association (Western District).—Mr. William Wilson, Engineer and Manager of the Burton-on-Trent Gas-Works, has promised to address the members at the nineteenth annual meeting of the Association next Saturday afternoon, in the Royal Technical College, Glasgow. The meeting will be followed by a social gathering.

NATIONAL GAS EXHIBITION, 1923.

Several references have already been made in the pages of the "Journal" to the National Gas Exhibition which it is intended to hold in Bingley Hall, Birmingham, from Sept. 17 to Oct. 3 next—the last three days of the exhibition being those of the annual conference in Birmingham of the British Commercial Gas Association.

The President of the exhibition is the Right Hon. the Lord Mayor of Birmingham (Alderman David Davis, J.P.); the Chairman of the Executive Committee, Alderman J. H. Lloyd, M.A., J.P. (President of the British Commercial Gas Association and Chairman of the Birmingham Corporation Gas Committee); the Deputy Chairman, Mr. A. W. Smith (General Manager and Secretary of the Birmingham Gas Department); the Hon. Secretary, Mr. R. J. Rogers, Gas Department, Council House, Birmingham; and the Exhibition Director, Mr. Charles Stanley, No. 27, Paradise Street, Birmingham. The exhibition is under the auspices of the national organizations of the industry and the leading corporation gas committees and boards of gas companies; and the first list of Vice-Presidents comprises Mr. D. Milne Watson, Mr. J. D. Smith, Dr. Charles Carpenter, the Right Hon. Lord Riddell, Mr. Samuel Tagg, Mr. James Paterson, and Mr. F. W. Goodenough. It is gratifying to learn that many applications for space have already been received from important manufacturers of gas appliances; and it would appear that the capacity of Bingley Hall will be taxed to the utmost to accommodate those desirous of exhibiting. The prospectus and plan of the hall, which are now available, furnish full information to those intending to apply for space.

Birmingham is an admirable centre for the holding of an exhibition of this character; and the autumn of this year is considered to be an opportune time for the industry to make a combined effort to demonstrate to the public at large the various ways in which gas may be utilized in the service of industry and in domestic life, and to show that the industry is a live one. In view of the criticism and Press stunts which have recently been levelled at the gas industry, it is felt that an official gas exhibition offers the means by which national publicity may be produced.

While most of the organization work will devolve on the representatives of the gas industry in the Midland Counties, it is desired that every possible assistance should be rendered by everyone in the industry in making the exhibition a success. The Executive Committee will shortly be issuing an appeal for financial assistance from undertakings, in order to defray the cost of the working demonstrations, competitions, publicity, and other expenses incidental to the running of a national exhibition of this character. Details of this scheme are now being prepared, and will be shortly considered by the Executive Committee.

In order to spread the interest of gas engineers and others concerned in the exhibition for the period when it will be open—viz., Sept. 17 to Oct. 3—it is hoped that various District Associations will arrange for a meeting to be held in Birmingham. Suitable accommodation in the way of conference halls will be available in the exhibition. It is also anticipated that a joint meeting of the Junior Gas Associations of the country, and also a joint meeting of the Gas Salesmen's Circles will be held during the first fortnight of the exhibition.

For the younger members of the industry, the historical section should prove of much interest, as it is hoped that the Murdoch relics, in the way of original letters, &c., may be available for exhibition, together with other historical apparatus connected with the industry. Offers to loan historical exhibits will be heartily welcomed by the Executive Committee.

Manufacturers who desire suitable space should make early application to the Exhibition Director. The Executive Committee have been fortunate in arranging with Mr. Charles Stanley to act in this capacity. Mr. Stanley has had a life-long experience in organizing exhibitions of all kinds, and is the General Manager of the British Industries Fair, Birmingham. He has also arranged many successful exhibitions in connection with the foundry trades, business efficiency exhibitions, &c., in the Midland District.

A High-Duty Revolving Gas-Producer.

The United States Cast-Iron Pipe and Foundry Company's self-contained producer, using bituminous coal, was illustrated in a recent issue of the "Gas Age Record." It is mechanically operated, and high in efficiency, gasifying 100,000 lbs. per 24 hours of bituminous coal, to produce a gas with a calorific value of 150 to 160 B.Th.U., and containing about 40 p.ct. of combustible matter. The main body of the producer revolves, while the top and base (both water sealed) are stationary. Two stirrers passing through the stationary top also revolve in the contrary direction to the rotating fuel bed. The effect is to discourage clinkering, break up the solid coking surface of the carbonizing coal at the top of the bed, and stir up the fuel in such a way as to prevent the formation of chimneys or channels. The stirrers are water-cooled and rotated by worm gear operated by an electric motor at the base, which also drives the revolving shell. Blast air comes from a centrifugal steam turbo-blower, and passes through a central pipe up into a distributor beneath the fuel bed. Coal is fed in by a revolving vane feeder, the speed of which is easily regulated.

GAS FOR INDUSTRIAL PURPOSES.

Interesting Demonstration in Glasgow.

Members of the Glasgow and West of Scotland Association of Foremen Engineers and Draughtsmen were privileged last Saturday week, by the kind permission of the Glasgow Corporation Gas Department, to visit the demonstration rooms and workshops at Walls Street. The visitors, to the number of 130, were received in the distribution department by Mr. E. E. Stones (Assistant General Manager) and Mr. J. M'Isaac (the Superintendent of the Walls Street Station).

At the outset, Councillor Paterson (Convener of the Sub-Committee) extended a cordial welcome to the members of the Association. They were glad, he said, to have with them at Walls Street that afternoon such a large body of gentlemen who were prominent in the engineering industry along the district of Clydeside. He felt that what the Glasgow Corporation Gas Department would show them that day would impress upon them the importance of gas in heat-treatment operations.

At this stage of the proceedings Mr. M'Isaac read a paper on "Industrial Fuels," of which the following are extracts.

INDUSTRIAL FUELS.

Since there is a variety of metals used to complete the construction of all machinery, the method of heat-treatment will vary according to the mechanical function which each part is expected to perform. Heat-treatment operations common to all types of engineering may be summarized as follows:

Forging . .	1300° to 1400° C.	Annealing . .	745° C.
Hardening .	760° C.	Casehardening	920° C.
Reheating . .	720° C.	Tempering .	240° to 265° C.
Plate heating .	900° to 1200° C.	Rivet heating.	1000° to 1150° C.

Briefly stated, every heating problem may be divided into two parts—namely, heat generation, and heat application or absorption. Heat may be obtained in several ways; but once the heat is generated, the next step in any furnace is to effect a transfer to the work to be heated. This transfer is termed absorption. Absorption efficiency is very largely dependent on the form in which the heat is generated. It is well known that radiant heat is the highest in absorption efficiency, and also that its even diffusion is least injurious to the metal. The control of furnace temperatures is secured through effecting a balance between generation and absorption.

Owing to the great difficulty experienced in the control of the air supply when using solid or liquid fuels, the heat losses are considerable, and in many instances may amount to 25 p.ct. in excess of actual requirements.

It will be evident that if we are to get the highest value for the money expended for our heating operations, furnaces and fuel efficiencies must have the fullest consideration. In many instances the relative fuel cost is the only factor taken into account; while other important factors are not thought worthy of consideration. There is also the question of quality and quantity of parts heat-treated, which, after all, is most important with any manufacturer; since where is the gain, if costs on preliminary operations are reduced in value due to unsatisfactory heat-treatment?

To analyze any heat proposition, we have five component parts to consider and decide upon:

1. Class and weight of material to be heated.
2. Temperature.
3. Available fuels and their relative costs.
4. Suitable furnace designs and their relative efficiencies.
5. Working costs in relation to output.

For comparative purposes we can take one ton of steel raised to a temperature of 1200° C. (2192° Fahr.), and endeavour to arrive at comparative figures from fuel-cost tables, as follows:

Coal	at 35s. per ton	= ·187d. per lb.	= ·145 therm.
Oil	at 70s. ,,	= ·375d. ,,	= ·180 ,,
Coal gas at 2s. per 1000 c.ft.		= ·744d. ,,	= ·155 ,,

Producer gas:

Coal at 30s. per ton		= ·16d. per lb.	= ·143 therm.
Coke at 30s. ,,	,,	= ·16d. ,,	= ·120 ,,

To raise one ton of steel to a temperature of 1200° C. requires the following heat units, according to the fuel used:

Coal . .	14,500 units	= 47·4 lbs.	= 6·87 therms = 8·86d.
Oil . .	18,000 ,,	= 38·0 ,,	= 6·84 ,, = 1s. 2·25d.
Coal gas .	15,500 ,,	= 44·3 ,,	= 6·86 ,, = 2s. 8·9d.

Producer gas:

Coal . .	14,350 units	= 47 lbs.	= 6·74 therms = 7·5d.
Coke . .	12,000 ,,	= 57·7 ,,	= 6·82 ,, = 9·2d.

These figures represent the actual fuel quantities, irrespective of that which must be used for heating the working chamber, which amount will be in proportion to the relative furnace efficiencies for the class of fuel used. This table of relative fuel costs would seem to indicate that coal and producer gas have no competitors with regard to cost; but it is necessary to analyze the actual working of each type of furnace to arrive at the true finding.

Assuming a furnace using each type of fuel at the following

GLASGOW CORPORATION GAS DEPARTMENT. INDUSTRIAL APPLIANCES DEMONSTRATION ROOM.

View from the Model Foundry, showing various appliances installed, all of which can be put into action. The existing room at the far end will be used as a Staff Lecture-Hall.

fuel rates per hour, we get figures which represent time and cost per ton of metal heated, as follows:

Fuel.	Per Hour.	P.Ct Efficiency.	Lbs. Fuel.	Time per Ton.	Cost per Ton.	Labour Cost.	Total.
	Lbs.			Hr. Mins.	s. d.	s. d.	s. d.
Coal at . . .	250	15	37·5	1 10	4 0·6	1 0	5 0·5
Oil at	250	20	50·0	0 55	7 1·5	0 4	7 5·5
Coal gas at . .	150	33	49·5	0 58	8 11·73	*Nil*	8 11·73
Producer gas—							
Coal at . . .	250	10	25·0	1 13	3 7·52	2 0	5 7·52
Coke at . . .	200	10	20·0	1 11	3 2	2 0	5 2

From the foregoing table, we obtain all the essential factors which govern the heating of one ton of metal; and, as will be noted, the actual costs are more evenly balanced, with the exception of the time factor, which varies in each case.

Assuming the working day to be six hours, and allowing thirty minutes for handling each ton, we should get the following output from each type of furnace under the foregoing conditions:

Coal at 1 hr. 10 mins. per ton *plus* 30 mins. = 1 hr. 40 mins. = 3·6 tons
Oil at 0 ,, 55 ,, ,, ,, ,, = 1 ,, 25 ,, = 4·23 ,,
Coal gas at 0 ,, 58 ,, ,, ,, ,, = 1 ,, 28 ,, = 4·0 ,,
Producer gas:
Coal at 1 hr. 13 mins. per ton *plus* 30 mins. = 1 hr. 43 mins. = 3·48 ,,
Coke at 1 ,, 11 ,, ,, ,, ,, = 1 ,, 41 ,, = 3·56 ,,

All the foregoing data are based on the assumption that the furnace is up to working heat and cold metal is being put into the hot furnace.

The following table gives approximate data covering the time taken to raise a furnace measuring 6 ft. 6 in. by 4 ft. by 3 ft. to a temperature of 1200° C., using the various classes of fuel at given rates per hour, and according to relative costs and efficiencies:

Fuel.	Fuel Rate per Hour.	P.Ct. Heat Losses.	Fuel Losses Rate per Hour.	Heat Losses Cost per Hour.	Time to Heat Up.	Total Fuel Used.	Total Cost *plus* Labour.
	Lbs.		Lbs.	s. d.		Lbs.	£ s. d.
Coal. . .	250	85	212	3 2·18	6	1500	1 15 2
Oil . . .	250	80	200	6 3	5	1250	1 19 1
Coal gas .	150	67	100	6 2	3	450	1 7 9
Producer gas—							
Coal . .	250	90	225	3 0	10	2500	2 13 4
Coke . .	200	90	180	2 4·8	10	2000	2 16 8

It will be noted that, while producer gas and coal show low costs on hourly rates, there is a complete reversion on the total amounts, and finally coal gas is easily the cheapest and most speedy class of fuel at present available for industrial use.

There are also advantages and disadvantages common to the use of each class of fuel, which may be summarized as follows:

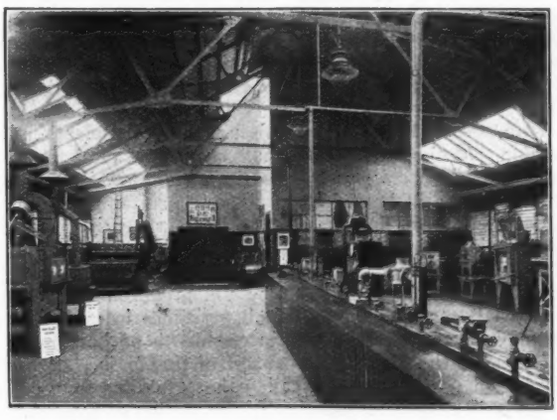
Coal offers fewest advantages. It requires the most handling, incurring heavy labour charges; it occupies considerable floor space for storage; furnace temperatures are difficult to control; and its use entails a large excess of air supply with consequent heat losses. In addition to the difficulty of adapting regenerative methods to the recovery of heat units from the waste gases, a chimney stalk is an absolute necessity, and initial and maintenance costs are heavy items.

Oil, though having a high calorific value, has disadvantages in that it is difficult to obtain good combustion on first lighting up. The risk of explosion is always present, and equal distribution of flame is impossible, and results in local heating. Even with excess air combustion is by no means perfect. Storage space is necessary, particularly when the oil is in barrels; but if in a tank above or below ground this disadvantage is not so apparent. However, in either case there is a leakage in handling and at the burners, which gives rise to dirty conditions, in addition to the money value represented by these losses.

Producer gas offers all the advantages of a gaseous fuel, but necessitates putting down a producing plant or a direct-fired producer adjacent to the furnace, both of which systems have their advantages. The self-contained producer is only an advantage when used in conjunction with a large plant, and incurs heavy initial expenditure in addition to heavy maintenance and labour costs. For every ton of coal gasified, approximately only 75 p.ct. of the gas available reaches the furnace, the loss being due to radiation between furnace and producer. The gas is of low calorific value, rarely exceeding 150 B.Th.U. per c.ft., requiring approximately 1·4 c.ft. of air for combustion; but, due to chimney effect and leakage through doors, the actual volume of air is usually 25 p.ct. in excess of requirements. It is also necessary to provide large regenerators with gas and air ports in proportion. Lighting-up and the reversion of valves call for careful attention owing to the risk of explosion, which, if it occurs, generally destroys the regenerators.

The direct-fired producer furnace does not actually occupy as much floor space as the self-contained type, nor are the reversing valves and connecting pipes necessary; heat losses are therefore less. The apparent advantages are control of gas and air within reasonable limits, and the ability to cease fuel consumption immediately the work is completed.

Coal gas, when used as an industrial fuel, offers advantages which are difficult to obtain with any other fuel. Irrespective of the specific heating operation under consideration, a design of furnace is possible which will give the highest efficiency under known methods of construction. It is also possible to obtain perfect combustion within very close limits, and with very wide latitude in the methods of applying the fuel, thereby ensuring equal distribution of heat. The gas and air supplies are under absolute control, making it possible to create any atmosphere in the furnace chamber. By adjustment, neutral, oxidizing, or reducing atmospheres may be readily obtained—an important consideration in the heat-treatment of metals. The possibility of adapting all forms of recuperation—irrespective of design—is a point of great importance, since it is a means whereby any difference in actual fuel costs is balanced, with the added advantage to the user of first-quality results. Owing to



Glasgow Corporation Gas Department. Industrial Appliances Demonstration Room.

View from Staff Lecture-Room end, showing model gas-heated Brass Foundry on right.

the ability to control the quantity of fuel that may be consumed per hour, it is possible to advance or retard the time required in first heating up the furnace chambers from cold. The fact that waste gases are exhausted at a temperature of about 200° C. (392° Fahr.), suggests that no better results are possible under known heating practice, and proves conclusively that coal gas is therefore the best solution for any heating problem.

Advantages of Gaseous Fuels.

(1) Perfect combustion can be maintained. No smoke is produced, therefore no stack is required.
(2) Changes of temperature being less, the furnace as a whole lasts much longer, and maintenance costs are very low.
(3) No handling of fuel and no storage space needed.
(4) Only one-half of the floor space is required for the same furnace-chamber capacity.
(5) No ashes, clinkering, or cartage charges.
(6) Lower capital costs in every respect.

At the close of the lecture Mr. M'Isaac exhibited the following lantern slides: (1) A single-ended forging furnace measuring 30 in. by 24 in. by 12 in., specially designed to deal with mixed drop-forgings at 1250° C. It was explained that the average output in metal was 500 lbs. per hour, and the maximum consumption 1200 c.ft., making an average of 500 c.ft. per hour. (2) A double-ended furnace of similar construction measuring 54 in. by 51 in. by 39 in., which was used in forging crank heads and connecting rods for marine engines. Here the required temperature was 1400° C., and the average output one ton per hour. The maximum gas consumption was 6000 c.ft., the average consumption being 2000 c.ft. per hour. (3) A similar furnace for lighter work, measuring 54 in. by 24 in. by 18 in. The working temperature was 1400° C.; maximum consumption 4000 c.ft.; average rate maintained 1500 c.ft. per hour; average output in metal 10 cwt. per hour. (4) An oven of similar design measuring 72 in. by 36 in. by 24 in., and used principally for the manufacture of springs for Diesel engines. Slides (5) and (6) showed a battery of seven ovens of various dimensions for coiling, hardening, and tempering spiral and other springs. (7) An oven furnace measuring 54 in. by 26 in. by 24 in., in use for the manufacture of chains and anchor forgings. (8) An oven furnace measuring 60 in. by 48 in. by 30 in. for case hardening purposes, having a maximum gas consumption of 1000 c.ft. per hour. (9) An oven furnace for annealing wire, measuring 54 in. by 36 in. by 30 in., and having a maximum consumption of 750 c.ft. per hour. (10) An oven furnace measuring 22 ft. 6 in. in length, for annealing tool-steel bars, and having a consumption of 3500 c.ft. per hour. This, it was explained, is capable of taking a load of 35 cwts. (11) A similar type of furnace, but using air under a pressure of 2 in. water gauge, and capable of taking seven tons of metal. (12) A battery of natural-draught ovens measuring 36 in. by 24 in. by 12 in. in use for annealing file blanks. (13) Various types of ovens particularly suited for general heat-treatment. (14) A complete tool hardening installation of furnaces and quenching tanks. (15) Complete equipment of heat-treatment furnaces for dealing with motor-car component parts. (16) Another view of a similar installation for the heat treatment of aeroplane parts. (17) Four general views of heat-treatment shops. (18). A battery of belt-driven conveyor furnaces for the heat treatment of brass billets for stamping and extending. (19) A battery of metal-melting furnaces using gas with air under a pressure of 3 lbs. per sq. in.; each having a capacity of 200 tons.

Thereafter the visitors were taken through the various workshops and had opportunities for observing the following equipment at work: Fifteen furnaces specially adapted for dealing with all classes of tools, riveting, forging, &c., at a temperature between 350° and 1400° C.; a model brass foundry comprising a furnace for melting in crucibles of 700 lbs. capacity, and another for soft melts up to 1100 lbs. per melt; also a core-drying oven.

The visitors were entertained to tea, and Mr. Thomas M. Taylor, the President of the Association, took occasion to voice the gratitude of the members for the cordiality of the reception extended to them.

RESEARCH SUB-COMMITTEE OF THE GAS INVESTIGATION COMMITTEE OF THE INSTITUTION OF GAS ENGINEERS.

The "Fairweather" Recording Calorimeter.

Eighth Report.

(*Continued from Vol.* CLXI., *p.* 766.)

WATER CONTROL.

Suppose it is possible to make a C.V. determination with gas actually measured at 60° F. and 30-in. barometer.

W = water rate in c.c./hour.
G = gas rate in c.ft./hour.
t = temperature rise °C.
n = tabular number, corresponding to temperature and barometric pressure at inlet meter, *i.e.*, factor for reducing gas volume to its equivalent at 60° F. and 30-in. barometer.
For the moment n = 1·000.

Then C.V. = $\frac{3{\cdot}968\ Wt}{G}$ B.Th.U. per c.ft. at 60° F. and 30-in. barometer.

Now let the tabular number take any other value, n. The gas rate is supposed to remain constant despite changes in temperature and barometric pressure, or specific gravity of gas, by the operation of the escapement meter. However, this gas rate when reduced to 60° F. and 30-in. barometer will be changed to nG c.ft. per hour. In order then that the temperature rise should remain unaltered for gas of any one calorific value, W must automatically change to nW c.c. per hour.

It is an essential part of the design of the "Fairweather" Recorder that the water rate shall be proportional to the tabular number corresponding to the condition of the gas at inlet meter. This end is attained by suitably varying the head of water acting upon an orifice in a steatite nipple, the regulation being automatic.

The variation in head is brought about by varying the depth of immersion of the nipple in a cup carried by a box which floats in a vessel of oil. Except in so far as there may be slight variations in the depth of immersion of the float in the oil, the movement of the surface of the oil as shown upon a gauge (called the "tabular gauge," or T.G.) is an exact reproduction of the motion of the cup.

Graduation of Tabular Gauge.—The standard water flow for the recorder when the tabular number is 1·000 = 2000 c.c. in 4 minutes, and the corresponding head of water is 20 ins.

It is *assumed* by the makers that the head of water necessary is directly proportional to the square of the water rate, and since it is desired that the water rate should be proportional to n, the head of water must be proportional to n^2, the actual head used being $20n^2$ ins. The movement of oil from the datum line (where n = 1·000) is 20 (1-n^2) ins. The "tabular gauge" is accurately graduated upon this basis from n = 0·900 to n = 1·100, thus covering a sufficient range of tabular numbers for most practical purposes in this country. The rise of oil for n = 0·900 is 3·80 ins., the fall for n = 1·100 is 4·20 ins., so that the tabular gauge is not quite a scale of equal parts. It is graduated for every 0·005 change in n, and 0·001 can be read with ease (0·1 p.ct.).

We understand that the steatite orifices controlling the water supply are tested and ground out until they deliver 2000 ± 5 c.c. in 4 minutes under a head of 20 ins. of water. The adjustment to exactly 2000 c.c. in 4 minutes when in position on the recorder is made by a slight departure from the standard 20-in. head, when n = 1·000, the adjustment usually falling within 0·10 in. of the standard head. If the delivery through the jet conforms with the assumed law of discharge it is easy to show that if the orifice had been made sufficiently large or small, to require a departure of 1·00 in. from the standard head, to secure the standard rate of 2000 c.c. in 4 minutes, and had been used in conjunction with the usual tabular gauge graduated for 20-in. head the error in flow would only be about 0·5 p.ct. for the extreme ends of the tabular scale, diminishing gradually to no error at the centre of the scale. Similarly a departure of 0·5 in. from the standard head produces barely 0·25 p.ct. error at the extreme ends of the tabular gauge.

In the case of the instrument supplied for examination the actual head for n = 1·000 was found to be 20·15 ins., thus being quite satisfactory in this respect.

Experimental Determination of Relation between Water-flow and Tabular Gauge.—It is necessary for the proper working of the recorder that the water flow for any gauge reading shall be (2000 x T.G.) c.c. in 4 minutes. Following the instructions given by the makers (p. 8 of Instructions) the oil was moved to various points on the tabular gauge, the float being quite free and sufficient time being allowed for drainage of oil to take place. The tests have been repeated on several occasions with closely similar results. It will be seen that the water flow is not accurately (2000 T.G.) for all readings with our instrument.

Table 5.

Reading on Tabular Gauge.	(2000 × T.G.)	Actual Flow C.C. in 4 Mins	Error in C.C.	Error per Cent. on Flow.
0·90	1800	1753	− 47	− 2·6
0·92	1840	1803	− 37	− 2·0
0·94	1880	1854	− 26	− 1·4
0·96	1920	1903	− 17	− 0·9
0·98	1960	1952	− 8	− 0·4
1·00	2000	2000	0·0	− 0·0
1·02	2040	2046	+ 6	+ 0·3
1·04	2080	2092	+ 12	+ 0·6
1·06	2120	2137	+ 17	+ 0·8
1·08	2160	2182	+ 22	+ 1·0
1·10	2200	2226	+ 26	+ 1·2

This deviation from the correct flow will not introduce any inaccuracy into control determinations made on the non-recording portion of the instrument,* but the C.V. shown on the chart will have a corresponding error in the opposite direction, being too high when the water rate is too low.

It is well known that an apparently trifling variation in the profile of a small orifice such as is used in the "Fairweather" recorder will sensibly affect the delivery when the head is varied. It is not surprising, therefore, to find that the discharge given above does not follow exactly the law $V=kh^{0.5}$. The discharge is not represented exactly by any simple formula of the type $V=kh^{x}$, although the figures given above conform with reasonable accuracy over the greater part of the tabular scale with $V=kh^{0.596}$. We are not in a position to say whether the jet supplied to us is exceptional in its behaviour, or whether the observed departure from the assumed law of discharge is typical of the size and type of orifice used for controlling the water supply to the recorder. As far as can be judged by eye the orifice supplied is in good condition.

It is highly probable that the makers have sent out orifices with other instruments conforming more closely with the assumed manner of discharge; for a discrepancy of the order shown above could hardly have been overlooked, particularly in the case of instruments subject to official inspection.

If the makers can produce jets which will give a delivery of the desired character, with sufficient accuracy when tested over the whole range of the tabular gauge, then the difficulty is at once removed, but it is clearly insufficient that the test should be confined to the attainment of a specified discharge under 20 ins. head of water. The same essential principles of operation of the recorder could be utilised with *any* jet, whatever its manner of discharge, but to make the scheme practicable would involve devising some method whereby the jets could be strictly reproducible. The steps to be followed would then be somewhat as follows: The discharge with the selected jet under various heads would be experimentally determined; the tabular gauge would then be empirically graduated, so that the positions of the float (or oil level) for various tabular numbers would correspond exactly with the water flows, as governed by the principles of operation of the recorder; the proportions and shape of the float chamber would require to be re-computed to give the required motion of the oil on the gauge under the influence of changes of volume of the air in the aerorthometer chamber. In other words, if jets cannot be obtained with the discharge specified in the makers' description of the recorder, it can still be made a workable instrument by re-designing and altering the float chamber. It is difficult to see how the trouble is to be overcome without such alteration.

At present only such orifices should be used as have been shown by actual test to correspond with sufficient accuracy to the standard tabular scale over the whole of its length.

Variation in Water Rate with Water Temperature.—There is a small but quite appreciable change in the water rate with inlet water temperature, which is not accounted for by thermal expansion, the results given being for the collected water as measured at 60° F.

We have determined this as 0·15 p.ct. increase in water rate per °C. increase in inlet water temperature, in the neighbourhood of 15·5° C. (0·086 p.ct. increase in water rate per °F. increase in temperature at 60° F.). A variation of room temperature or inlet water temperature between 50° F. and 70° F. may be considered as representing a reasonable variation, and will thus involve maximum variations of ± 0·86 p.ct. in the water rate for this temperature range. The point is also worthy of attention in the initial setting of the recorder if the water temperature at the time is greatly different from 60° F. In this respect we cannot agree with the makers that "this water control works very accurately, and is substantially not affected by variations in water temperature." The variation in water rate with temperature is much smaller than in the instrument previously examined (Fifth Report, p. 190), and is not affected by any temperature changes in the water passing through the calorimeter proper.

As will be shown in connection with the tabular gauge, an increase in room temperature of 10° F. by expanding the oil in the apparatus will cause a reduction in the water rate of 0·1 p.ct.

Irregular Variations in Water Rate.—Before starting the use of the circulating water system described later, the calorimeter was run directly on the Birmingham water supply, but this had soon to be abandoned.

The relatively large head of water used and the high velocity of the water through the controlling orifice do not prevent the clogging of the jet with suspended matter or organic matter from the water. Frequent cleaning of the steatite jet was necessary, and the water rate was falling in an irregular manner to the extent of about 5 p.ct. per day.

As giving some idea of the quantities concerned, it may be pointed out that a deposit in the form of a uniform film only 1/8000-in. thick round the orifice would reduce the water rate by 1 p.ct. and consequently cause the chart C.V. to be 1 p.ct. too high. There is not the slightest hesitation in saying that the "Fairweather" Recorder could not be run with satisfaction, directly upon the Birmingham water supply, or upon water supplies of a similar character. These are much more difficult to handle than the hard waters of the London area which offer no difficulty so far as the controlling jet is concerned, while any troubles in the coils of the calorimeter proper can, we understand, be overcome by the judicious use of a little dilute hydrochloric acid from time to time.

For the purposes of our tests the storage tank for the circulating system was filled with the clearest strained (through muslin) town water that could be obtained. The use of distilled water as originally contemplated was not practicable, for several reasons, (1) the quantity required, (2) the heavy replacements found to be necessary, (3) in the event of the circulating system failing the tank would in any case become contaminated with town water, (4) earlier operations had already infected the apparatus with organic growths which could not be removed without dismantling the whole apparatus, (5) the storage tank with the present system of cooling collects dust and dirt. For ordinary purposes the water supply would be considered highly satisfactory, but even with this specially treated circulating water supply it has not been possible to keep the water rate to its intended value. (The errors discussed in the two previous sections are considered separately.)

Occasionally the accumulated error has not exceeded 1 p.ct. in two or three days, but in general it has been 2 to 2·5 p.ct. per day, and invariably in the direction of a reduced water rate due to making up of the orifice.

By daily cleaning of the orifice we have been able to continue our observations of the behaviour of the recorder in other respects, but do not feel in a position to express an opinion at present as to the behaviour of the recorder when using water of an irreproachable character. It may be practicable to carry out further tests at a later date under conditions more favourable in this respect.

At all events the choice of a water supply for a continuous recording calorimeter is a matter which will have a very important influence upon the satisfaction to be derived from its operation.

Even on an extremely good water supply there is some doubt of the possibility of maintaining a desired water rate, over periods of considerable duration with any high degree of precision, using orifice control.

Some additional notes on the water system will be found in Appendix 2.*

* Unless the flow is strictly correct, it is not permissible to make direct use of the Table supplied with the instrument for converting temp. rise to B.Th.U., and ordinary calculation must be used.

* *Ibid.*

(*To be continued.*)

DEVELOPMENTS IN GAS-COOKERS.

By Dr. Harold Hartley, Chief Chemist of Radiation Limited.

[A Paper read before the Midland Junior Gas Association, March 1.]

(*Concluded from Vol. CLXI., p.* 838.)

The Oven.

In the design of the oven we have departed fundamentally from that previously adopted. As the result of our examination of the chemistry and physics of the cooking processes we had satisfied ourselves that a decrease in the excess of air passing through the oven would tend to improve the cooking results, and decided to work in the direction of a decreased flue loss. Heat is dissipated in two ways from the gas-oven:

(*a*) Through the walls.
(*b*) Through the flue outlet.

To reduce effectively the loss through the walls involves a large increase in the thickness of insulation, and the additional cost involved is out of all proportion to the annual saving which results. Economic conditions thus restrict progression along this line. The other source of loss has proved more amenable to restraint.

The ordinary gas-stove, with which you are familiar, has so much air passing through it that the carbon dioxide content of the flue products is generally between 1 and 2 p.ct. In this oven the carbon dioxide content varies from 8 to 10 p.ct., according to the conditions of use. The gas saving which has resulted is very marked in cooking operations, and, in addition, the means adopted have improved the oven from the point of view of cooking in a striking manner. With these points I will deal in detail later.

The most difficult problem to be solved in connection with the increase of carbon dioxide in the products was concerned with the condition known as "smothering." This is a point to which we have given considerable attention in the design of these new ovens.

It may interest you to know some of the decisions which were taken with regard to the essential features of an oven before the final construction was started.

We decided:

1. That the rated maximum consumption of the oven must be such as to ensure the attainment of a temperature of 400° Fahr. in ten minutes.
2. That the design of oven and burner must be such that were the gas pressure to increase sufficiently to allow of the maximum rated consumption being doubled inadvertently, the gas should continue to burn satisfactorily and there should be no danger of extinction of the flames.
3. That the temperature variation throughout the oven must be so small that we should be able to load the oven fully, to pack each shelf completely with foodstuffs, and cook these without the necessity of moving the food from one part of the oven to another during the process.
4. That the increase in thermal efficiency must be such that the use of the oven would allow of a saving of 25 p.ct. in the gas consumption, as compared with gas-ovens hitherto marketed, and must not involve the use of adjustable dampers.
5. That, if possible, means must be introduced to make cooking more automatic, to enable a properly cooked meal to be prepared by a person with little skill. The attainment of this ideal was of course entirely dependent on satisfaction of condition (3).

Let us now examine the finished appliance from the point of view of these conditions. The details given refer to the H. 15 size.

1. The rated maximum consumption of the H. 15 ovens is 20 c.ft. per hour of 500 B.Th.U. gas—*i.e.*, 10,000 B.Th.U. per hour. Starting from cold, a temperature of 400° Fahr. is attainable in ten minutes.
2. The consumption of this oven can be increased to 40 c.ft. per hour by increase of pressure, and the whole burner remains alight. It will hardly be necessary for me to add that if such an increase in pressure occurred, the oven would become so hot that it could not be used immediately for cooking. The pressure change necessary to bring about this increase in consumption would have to be such that the pressure of supply was quadrupled. This condition was so stringent that at first it was thought it would have to be modified, and the standard lowered to the extent of designing the appliance so that it should take care of a doubling of the pressure. As the work progressed, however, means were devised of satisfying the original standard. The tests were carried out with the door and all other joints in the cooker frame sealed additionally on the outer side.
3. The oven was loaded fully, and it was found to be possible to cook foodstuffs correctly without changing their position during the process.
4. At the beginning of the work thermal efficiency was determined by means of a maintenance test. The oven was lighted and, when hot, the gas was adjusted to maintain an average temperature of approximately 400° Fahr., the temperature throughout the whole of the cooking space being explored. The gas consumption was carefully noted, the calorific value estimated, and the B.Th.U. taken calculated. A second test was then made at a lower temperature—something below 350° Fahr.—and the B.Th.U. required also determined.

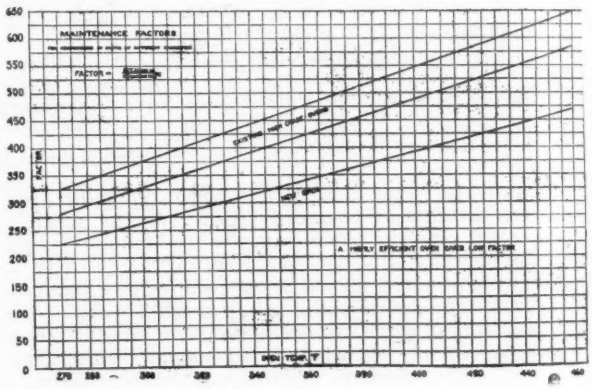


Fig. 1.

The object in view was to find the number of B.Th.U. required to maintain an average temperature throughout the cooking space 300° Fahr. above that of the laboratory. Having attained this result, then, to enable it to be compared with similar results for other ovens of different sizes, the following calculation was made: The cubical contents of the actual cooking space were determined, and from this was calculated the surface of the theoretical cube of the same capacity—*i.e.*, if "V" equals the volume of the cooking space, then $6\sqrt[3]{V^2}$ is the surface of the theoretical cube.

This result, divided into the total B.Th.U. taken per hour to maintain the oven at a temperature of 300° Fahr. above the laboratory,

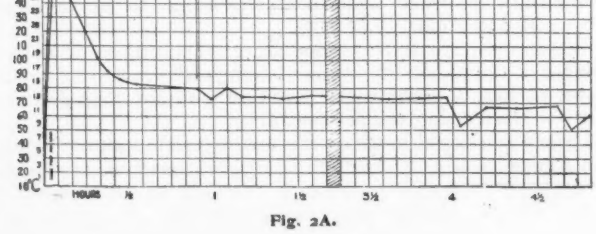


Fig. 2A.

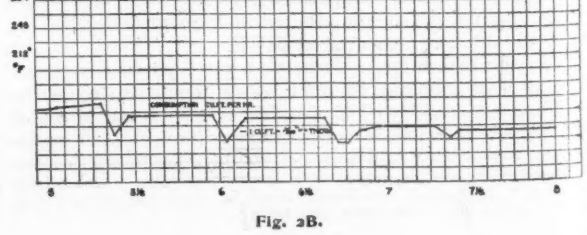


Fig. 2B.

gives a factor which is found to be strictly comparable for ovens of varying sizes. It is not sufficient to compute the amount of heat taken per cubic foot of oven space, as with ovens of given design, and having the same flue loss, the amount of heat taken per cubic foot of space decreases with the size of oven. That is to say, the larger the oven the smaller the surface exposed per unit of volume.

We have adopted, somewhat arbitrarily, a temperature of 300° Fahr. above the laboratory as our standard for comparison. A similar factor can be calculated, of course, for any required temperature. When this has been done, we have found that over the range required for cooking operations, the relation between our factor and temperature is represented graphically by a straight line passing through the origin (fig. 1.) The question arose as to whether the results of maintenance tests would indicate how various ovens would behave, from the consumption point of view, under actual cooking conditions. It has been contended that the maintenance test is of little value in this connection—a view with which we disagree. If the nature of the thermal operations carried out in the domestic oven is considered in the light of the charts previously given, it will be seen that in many cases they consist in inserting foodstuffs into an oven at the required temperature and maintaining that temperature in the products throughout the whole of the process. In the early stages, in order to test the contention, the following tests were made:

Two ovens were taken, each differing only in the size of the flue outlet. In the one the flue outlet was made to measure 5 in. by 1¼ in., while in the other it measured 2 in. by 1¼ in. In the first instance, maintenance tests were performed, and the energy required to maintain a temperature of 300° Fahr. above the laboratory determined. In the second series of tests, the cookers were adjusted to burn 20 c.ft. per hour, and after being alight for 15 minutes a bowl of dry sand was inserted on a grid shelf near the middle of each oven, together with two pyrometers. In each case one pyrometer rested on top of the sand, and the other was inserted in the middle of the sand. The gas was left burning at 20 c.ft. per hour until the upper pyrometer recorded a temperature of 400° Fahr., when the supply was decreased and adjusted to maintain, but not to exceed, this temperature on top of a load until such time as the pyrometer in the centre of the load had attained a temperature of 360° Fahr. The summary of the results obtained is appended:

—	—	Oven "A." Flue Outlet. 5 in. x 1¼ in.	Oven "B." Flue Outlet. 2 in. x 1¼ in.
Maintenance Test	B.Th.U. per hour	5535	4686
Sand Test	Time taken	110 minutes	105 minutes
	Temp. on top of load	399·2° Fahr.	402° Fahr.
	Temp. in load	360° Fahr.	360° Fahr.
	B.Th.U. employed	13,710	11,470

The ratio of the energy required in the maintenance tests was 1·19 to 1, whereas the ratio in the sand tests was 1·18 to 1.

It is realized, of course, that the temperature of 360° Fahr. to which the sand in the centre was heated is much higher than that attained within the centre of foodstuffs during the cooking operation; but it was felt that the results obtained gave a satisfactory indication of the behaviour to be expected from the two ovens during cooking. This was confirmed later by actual cooking tests, which further supported our view that the maintenance factor serves as a good indication of the thermal capabilities of different designs of oven when used for cooking.

During the later stages of the work in connection with the "New World" ovens, a bread-baking test was adopted as a simple means of determining the effect of any alteration on the cooking efficiency of the appliance. This was done because it was found possible to devise means to carry out such tests with satisfactory concordance, and because the test has the great advantage that it does not occupy more than an hour and a quarter for its completion. In the appended table there are given the results of typical bread-baking tests carried out in the H.15 size of the "New World" oven and an existing high-grade oven designed to take the same load:

Baking of Six 2-lb Loaves.

New Oven.			Existing High-Grade Oven.		
Time.	Meter.	Remarks.	Time.	Meter.	Remarks.
0	0·0 c.ft.	Oven lighted.	0	0·0 c.ft.	Oven lighted.
10 mins.	3·4 ,,	Dough inserted.	11 mins.	4·84 ,,	Dough inserted.
68 ,,	20·5 ,,	Bread removed.	73 ,,	30·0 ,,	Bread removed.
B.Th.U. employed.		9895 gross.	B.Th.U. employed.		14,220 gross.

Mention has been made already of the fact that better browned bread is obtained out of these new ovens than from the ordinary gas-oven. The baking results indicate that these ovens enable a saving to be effected of some 30 p.ct. in the thermal energy required to carry out cooking operations. It may not be out of place to give here some further cooking results obtained in this same "New World" oven.

Joint Roasted—Ribs of Beef.

Weight of uncooked joint	8 lbs. 15 ozs.
Weight of hot cooked ,,	6 lbs. 6 ozs.
Weight of dripping	— 12 ozs.
Net loss	1 lb. 13 ozs. = 20 p.ct.

Time.	Remarks.
9.50 a.m.	Oven lighted.
10 a.m.	Joint inserted.
12.15 p.m.	Gas turned off—joint removed.

Total gas used, 39 c.ft. = 16,950 B.Th.U.

Lunch Cooked—Leg of Lamb, Gooseberry Tart, Yorkshire Pudding.

Time.	Remarks.
11 a.m.	Oven lighted.
11.11	Joint inserted on grid on third runner.
12.16	Pie inserted on cake tin on top runner. Pudding inserted on bottom grid.
12.52	Pie taken out.
12.57	Joint removed.
1 p.m	Gas turned off—pudding removed.
Total duration of test	2 hours.
Total gas used	31 c.ft. = 14,000 B.Th.U.

Weight of uncooked joint	5 lbs. 4 ozs.
Weight of cooked ,,	4 lbs. 0 oz.
Weight of dripping	— 5 ozs.
Net loss	— 15 ozs. = 18 p.ct.
Weight of uncooked pie in dish	4 lbs. 5 ozs.
Weight of cooked ,, ,,	4 lbs. 1 oz.
Weight of batter and lard	1 lb. 8 ozs.
Weight of Yorkshire pudding	1 lb. 5 ozs.

N.B.—The Yorkshire pudding was cooked below, and received some fat from, the joint.

AUTOMATIC CONTROL.

It follows from what has been said already that it should be possible to introduce a device to enable cooking operations to be carried out without continual supervision. The design of the oven is such that there is not a great temperature variation throughout the cooking space, and it has been indicated that the cooking operation involves attaining and maintaining a given temperature in the products. It seems likely, therefore, that these operations can be subjected to automatic control; and the next stage in the work was to devise a suitable regulator. It had to be borne in mind that whatever device was employed, its design must be such as to enable the temperature maintained to be varied as and when required. Such an appliance, the "Regulo" heat controller, has been constructed. It has a graduated head capable of rotation. This head is divided into three main zones, labelled "hot," "medium," and "cool," and each zone is further subdivided. By rotation of the head it is possible to vary the temperature of the oven by about 360° Fahr. The head is divided into

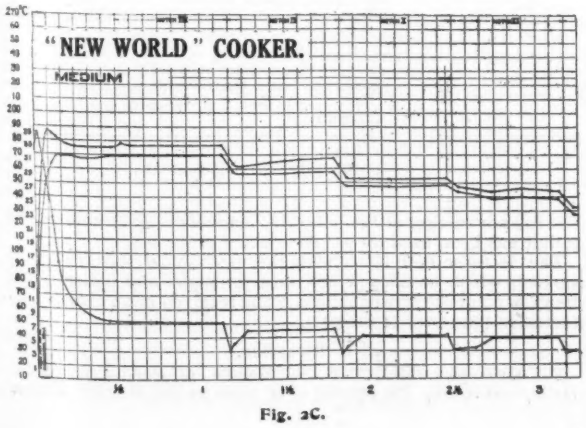


Fig. 2C.

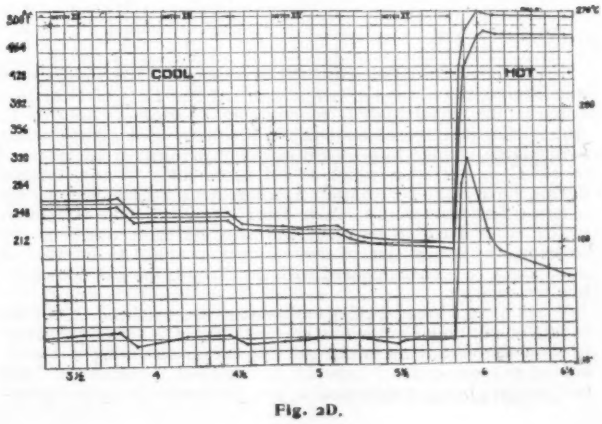


Fig. 2D.

fourteen sections, and rotation through one section varies the temperature of the oven by some 26° Fahr.

Tables 2A, B, C, D, show the results of a test carried out with a "Regulo" controller to determine the accuracy of its operation. At the beginning of the test the head was rotated to a position giving a maximum temperature, and the oven was lighted. Thermometers inserted near the top and bottom of the cooking space indicated the temperature attained. On the chart the ordinate for the upper curves represents temperatures attained, that for the bottom curves indicating consumption in cubic feet per hour, the abscissæ in each case indicating time. In the early stages, temperature observations were taken at minute intervals; but when the oven approached a steady state these were taken less frequently. In this particular test the temperature rose sharply to 260° C.; this temperature being attained in thirteen minutes. For the next three hours the temperature was maintained steadily. After three hours twenty minutes the head was rotated through one division, and later through successive divisions at suitable intervals. It will be seen from the steps on the chart that each movement is followed by an almost constant drop in temperature. As the temperatures get lower, the difference between the two thermometers gradually decreases. The day's test was stopped after the head had been rotated to the seventh notch. On the following morning the "Regulo" head was rotated one notch further, the oven lighted, and the series continued; and here again it will be seen that the instrument worked satisfactorily, the temperature falling step by step as the head was rotated. Complete rotation of the head to the fifteenth notch lowered the temperature to 100° C. After determining the temperature at this setting, the head was then rotated to the full-on position again. The temperature rose rapidly, and the steady state maintained with this setting was identical with that attained on the previous day.

Subsequently it was decided to amend the graduation of the "Regulo" head, reversing the order of numbering (mark No. 15 now being the hottest). Also the setting of the instrument was altered to give a higher temperature at mark No. 1.

Variation in Gas Rate as Head Rotated.

The gas consumption curves are also of interest. It will be noticed that a rotation of the head is followed immediately by a sharp drop in consumption, which then increases gradually as the temperature within the oven falls and the controller comes into operation. A steady consumption is attained again some eight minutes after the rotation of the head in the hotter regions, while, of course, at lower temperatures the change in consumption is somewhat slower. In ordinary cooking processes it is not necessary to alter the setting during working.

Effect of Pressure Changes.

It is difficult to overstate the advantages which result by the adoption of the controller, provided the design of the oven is satisfactory for its use. The curves to which reference has already been made show that rotation of the head to any fixed point results in the production of a given temperature within the oven. In view of the results which I have been able to give, there will be no question on this point, at any rate under conditions of constant pressure and constant calorific value. It will be of interest to consider what effect would result from changes of either of these. Actually we have not had an opportunity of carrying out tests under conditions of large calorific variation; but as the effect of a calorific value change would be analogous to that produced by pressure change, a consideration of the behaviour of the instrument when subjected to pressure changes will settle this point. Below are summarized the results of a number of tests carried out over a period of two days, during which the pressure of supply was varied from 15-10ths to 60-10ths. The temperatures reported are those taken with a thermometer in the centre of the oven.

15-10ths.	60-10ths.	Difference.	15-10ths.	60-10ths.	Difference.
Temperatures.			Gas Rate, C.Ft. per Hour.		
213° C.	223° C.	10° C.	12·5	13·2	0·7
234° C.	248° C.	14° C.	14·0	15·5	1·5
260° C.	279° C.	19° C.	16·0	17·5	1·5

It will be noticed that even if the pressure of the supply were quadrupled, the change in temperature at 260° C. (500° Fahr.)—a temperature higher than is required for cooking—is only 19° C. At 220° C.—a temperature required for many cooking operations—this large change in pressure would only result in an increase of 10° C., a variation which would cause little, if any, trouble during the cooking operation. At lower temperatures the change is less. The tests were made in the H.15 oven. This same controller is designed to be employed with the three ovens of the series, as the largest size of oven does not require an increase of more than 10 p.ct. compared with the H.15 in the gas consumption for cooking.

When using a bread-baking test as an efficiency check, the whole is carried out under automatic control. Fig. 3 has been prepared to show the variations in the gas rate occurring during a bread-baking process under "Regulo" control, which ensures a fixed temperature being maintained in the products during the operation. These conditions appear almost ideal for cooking, and it is obvious from the chart that the desired variation could not be brought about by hand in the ordinary way.

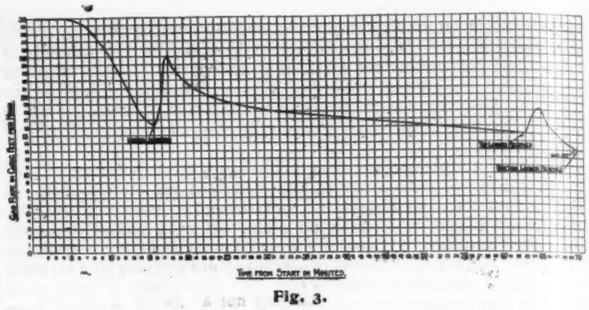


Fig. 3.

Advantages of the "Regulo."

This device, then, enables given conditions to be attained from day to day with the oven. In the actual process of cooking it offers very many advantages. With it, it is only necessary for the head to be rotated to the required position, determined by the character of the food to be cooked, the gas to be turned on, and the burner lighted. At the end of ten minutes or so the oven is hot (as is shown by the fact that the flames have become small), the food is inserted, and no further attention is necessary until the time required for complete cooking has elapsed. At the end of that period the food can be withdrawn. During the cooking operation the oven requires no watching. The operator is no longer dependent on her judgment of the flame length for determining the conditions within the oven—once the position of the graduated head is set, the temperature within the oven is determined. Waste of gas and burning of food are avoided, and—a point which will appeal most to the housewife—other housework can be carried out without fear of spoiling the food in the oven.

Recently it was reported to me that a certain oven with which we were experimenting would only allow of two loaves being baked properly on each shelf, though the shelves themselves were just large enough to take three loaves each. Careful baking tests had been made, the experimenter controlling the gas rate by means of a test meter; but with three loaves per shelf, burning occurred. In view of the experience of the experimenter, it seemed almost unnecessary to repeat the attempt, using the "Regulo." As a forlorn hope, however, this was done. Result—three loaves baked per shelf without burning.

As showing the value of the controller as a time saver, the following may be related. A fruit cake weighing 3 lbs. was inserted in an oven, with the "Regulo" head suitably adjusted, at 12.55 p.m. The experimenter then left for lunch. Having other business to attend to, he did not return to the laboratory until 3.50 p.m., the cake being left unattended in the meantime. At 4 p.m. the oven was opened and the cake removed perfectly baked.

A very large number of cooking tests have been carried out to determine the most suitable temperature conditions for different classes of food. These are summarized in the table below. As the popular ideas regarding best cooking temperatures have been found quite erroneous, it was decided not to graduate the head in temperatures.

"Regulo" Settings for Cooking Different Foodstuffs.

Setting.	Foodstuff.
Mark 1	Milk puddings. Custards (without pastry). Contents of pies, stews, &c.
,, 2	Fruit cakes.
,, 3	Macaroons.
,, 4	Madeira cakes. Pork pies (from raw materials).
,, 5	Queen cakes.
,, 7	Bread. Tea cakes. Sponge and other light cakes. Jam or lemon-cheese tartlets. Tarts. Yorkshire pudding. Poultry.
,, 8	Meat. Pies (after cooking contents).

The full advantages of the "Regulo" cannot really be appreciated until it has been used for actual cooking processes.

The lecturer then dealt with the mechanical features of the cookers, which embody a new unit principle, and indicate that the view-point of the gas company has received more careful consideration than ever in the past.

Discussion.

The Chairman (Mr. C. F. W. Rendle, of Redditch) said Dr. Hartley was voicing the opinion of all when he said their one aim was

to cultivate a preference for the use of appliances which had a high thermal efficiency, and were therefore economical in gas consumption.

Mr. L. H. Thomas, senior Vice-President (Nechells), moved a vote of thanks to Dr. Hartley for his excellent paper. His references to the properties of food and to the way in which it should be cooked were important and worthy of wide dissemination. In his opinion the cooker seemed to have many ideal features. His hope was that it might lead to an increase in gas consumption.

Mr. G. M. Lewis (Birmingham), in seconding, expressed the opinion that Radiation Limited had done honour to the Association in that this was the first time the stove had been exhibited and described in a corporate way. The review of it had been both scientific and practical. Personally he was glad Dr. Hartley had emphasized thermal efficiency and domestic efficiency; he thought the two would go hand-in-hand.

The resolution was heartily adopted.

Dr. E. W. Smith (London) said he was not aware of the lecture until he met Mr. J. W. Wood in the train as he was on his way to London. He therefore broke his journey in order to hear his old college companion. They had left college about the same time, and both had gone into the gas industry. He was proud that Dr. Hartley was making such a great success of this most important appliance. He was glad he was so practical, for he had shown that he regarded domestic efficiency as being as important as thermal efficiency. The cooker seemed to embody many of the latest developments; and he would be glad to use one if it gave anything like the results that had been indicated. The gas industry ought to consider itself fortunate in having a large undertaking like Radiation, which through its research staff tackled scientific problems and then applied them in a practical way to everyday domestic needs. He congratulated Dr. Hartley upon his lecture.

Mr. B. J. Bell (Cardiff), formerly the Secretary of the Association, pointed out that the old-fashioned straight-bar cooker had one advantage in that it allowed vessels to be manipulated easily; the result was that gas consumers got into the habit of looking for easy manipulation. They now found that pots were often upset owing to altered construction in some stoves. In Cardiff they had received complaints that the hotplate bars were not satisfactory in the direction mentioned. He had also heard the statement made that the serrated ends of the hotplate were responsible for the collection of fat. The cooker seemed to represent a considerable advance; and a certain amount of difficulty might be in prospect with regard to restocking, replacing, and renewing. The thermostat was not altogether new. There was one that could be fitted to existing cookers; but the obstacle in popularizing this was the addition of cost—about 45s. Many people would not pay this merely on the assurance that a reduction in the gas bill could be effected.

Mr. R. G. Marsh (Birmingham) also joined in the congratulations to Dr. Hartley. He regarded the successful application of the thermostatic arrangement for controlling the oven temperature as the outstanding feature. As to the curves shown in the temperature gradients, he observed that upon turning-down to the lower notch there was a drop in temperature, but that afterwards there was a recovery of ten degrees by the time the knob was turned to the next notch. What would have happened if the period of time had been longer before turning the knob to the second notch? He understood that the interior side-linings of the oven were enamelled sheet-steel, which was embossed to carry grid shelves. Was there not a possibility of wearing taking place on this enamel, with consequent chipping after constant use?

Mr. S. W. Simmons (Dudley) asked: "What are we to do with all the old cookers?" It seemed to him it would be necessary to educate the cook in regard to the time periods for the alteration to the various notches. Again, what would be the effect, if any, consequent upon the opening of the oven door? Would not the temperature change "sadden" a cake? From a maintenance point of view something was certainly to be said for having small bar sections. There was advantage in having a front tap rail; but at the same time, with careless cooks, damage might easily be done to the thumbpiece of the tap.

Mr. W. E. Cadwallader (Birmingham) inquired what would be the effect of draught on the flame when the thermostat was brought into operation and there was a cutting-down to the minimum position. It had to be remembered that there was frequently a good deal of draught where cookers were placed. There might be a tendency to light-back. He thought the provision of long legs would facilitate cleaning. As to the hotplate, it was clear that users would have to get into the habit of placing utensils upon it carefully.

Mr. Luke Sturdy (Birmingham) put forward the suggestion that it might be an advantage to have the thermostat in the front rather than on the side of the cooker. He was not sure that it was a good arrangement to have all the taps on the front. He welcomed the abolition of the crown chamber.

Mr. G. E. Burden (Redditch) noted a good point in the provision of plenty of working space in the oven.

Mr. J. W. Wood (Fuel Department, Leeds University) said it was satisfactory to note that the gas-cooker had fallen into the capable hands of Dr. Hartley, and that considerable improvements were to be expected. He regarded the preliminary part of the lecture in relation to the constitution of food as most important, for without a thorough knowledge of this one would be in the dark in searching for improvements of practical value. As Research Chemist to the Gas Investigation Committee, he had carried out many hundreds of thermal efficiency determinations. It had been pointed out that the determination of the thermal efficiency was not a simple exercise in specific heat. They had not only to determine the ratio between the quantity of heat usefully applied and the quantity of heat supplied to the appliances. The conditions under which it was supplied were very important. American figures relating to thermal efficiencies seemed to approximate to 38 p.ct. for hotplates. Would Dr. Hartley state what size of vessel was used in the boiling tests? He had found from his own figures that a change in the size of the vessel from 7 in. to 9 in. would make a great difference in the thermal efficiency. The specifications under which the tests were carried out were most important. He was glad that in the newer cookers stress had been laid on the question of domestic efficiency. Thermal efficiency of the burners had advanced to a much smaller extent than had domestic efficiency. He had made tests on cookers and hotplates of alleged obsolete patterns, in which the efficiencies were 40 p.ct. and 50 p.ct. Recent advances seemed to have been more in the direction of convenience of operation, better provision for cleaning, and of newer designs of burners than in improvement in thermal efficiency of the burner itself.

Mr. H. R. Hems (Industrial Research Laboratory, Birmingham) pointed to the need of a regulator on the gas-furnace. Now that a regulator was provided for the cooker, could not something of the kind be done for the furnace? Again, what was the objection to the separation of the oven from the hotplate?

The Chairman said there was certainly ample scope for thermostatic control in many industrial processes—for example, in enamelling ovens, and where the maintenance of a constant temperature was important.

Dr. Hartley, in the course of his reply, said that a proper understanding of the changes occurring in cooking was essential for the improvement of the gas-cooker. This point could not be over-emphasized; too often the gas-oven was treated as though it was merely a box with a burner in it. Many views which were prevalent regarding cooking conditions were erroneous. It could be demonstrated with the new cookers that it would be possible to bake six 2 lb. loaves for 1d.—a result which would trouble the electrical people. He regarded the heat regulator as a most important development, no matter what the view-point. It was useless offering a controller unless with it there was supplied ample information to indicate how correct results were to be obtained. He wished to emphasize that with the "Regulo" it was not necessary either to alter the setting or to open the oven door during the cooking operation. With regard to the small temperature fluctuations during the test of the "Regulo" at different settings, these were probably due to the small lag in the instrument indicated by the consumption variation. Each setting corresponded to a definite temperature. Special provision had been made to counteract the effects of floor draughts. If the controller had been placed so that the head projected from the front of the oven, it would have been necessary to increase the door-frame width, with resulting increase in cost and no working advantage. The head was designed so that the graduations were visible from the front of the oven. It was not anticipated that wear of the enamelled sides would occur; experimental cookers had been in use for over twelve months without wear occurring. Further, one of the Associated Companies for many years had made a practice of supplying enamelled runners in one of their cookers. Regarding the points raised in connection with the hotplate, Dr. Hartley considered that the continued use of the wrought-iron bar type was due to the convenience it offered. The consumers paid heavily for this convenience. The "efficiency" hotplate required more care, but was not very exacting in this connection. The ribs on the cornice ensured proper combustion with the side burners even when large pans were in use. The removal of grease from a plain cornice was little, if any, easier than from these cornices in which the ribs were spaced well apart. He knew of only one hotplate which now might be regarded as obsolete which was capable of giving an efficiency of 50 p.ct. There was a big difference in the efficiency obtainable with many of the so called "efficiency" hotplates on the market. It was recognized that the introduction of improved appliances raised a difficulty for the gas companies. If the gas industry were to supply old-type apparatus and did not introduce improvements leading to economies, then the industry would ultimately lose its load. If improved contrivances were to be introduced, then gas companies and corporations must periodically make a "clean cut." All materials should be depreciated in their books, so that scrapping would not involve a financial loss. Continued progress was essential to success. As to the suggestion to separate the oven from the hotplate, he pointed out that this could be done, but that, although there was a steady demand for such designs, the high cost involved was a limiting factor. Dr. Hartley said he much appreciated the references made by Dr. Smith, and the fact that he broke his railway journey in order to be present. He was pleased with the reception which had been given to the cooker, and especially with the references which had been made to the research work carried out by Radiation. It was perhaps hardly necessary for him to mention that the appliance which he had demonstrated represented not merely the work carried out by several experimenters, but the collated experience of the several constituent firms.

Combustibility of Coke.—The United States Bureau of Mines are carrying out tests with the object of ascertaining whether the combustibility of coke varies with the size of the pieces.

Gas in the Leather Industry.—In the modern boot factory, it is no exaggeration to say that there are scores of machines each of which requires gas for heating purposes, in order efficiently to carry out its particular section of the work involved in the production of the finished article. The current issue of that useful publication of the British Commercial Gas Association, "A Thousand-and One Uses for Gas" (No. 109), contains over thirty photographs and descriptions of appliances used in boot factories. Readers should find this publication of general interest.

Fuel Experts and Anthracite Stove Explosions.—Both Scotland Yard and the French Government are investigating the recent mysterious explosions of anthracite stoves. By means of "doped" anthracite, Home Office experts have been for some time attempting to reconstruct these explosions; but as yet the causes remain unknown. One theory is that partial combustion of anthracite results in the accumulation of carbon monoxide, which is ignited when a certain pressure and temperature are reached. Whatever the cause, the experts state that all danger may be avoided by using small coke, known as "coke nuts," as a substitute for anthracite. Subjected to a temperature of 2000° Fahr. for a period of twelve hours at the gas-works, there is, it is said, not the slightest danger of "coke nuts" containing anything whatever of an explosive nature. Fuel experts are agreed that it is quite equal in every way to anthracite.

CATON AND COOMBS' SAFETY DEVICES FOR STOKING MACHINERY.

(Patent Applied for.)

With the introduction during recent years of so much machinery in horizontal retort-houses, the safety devices designed by Messrs. W. E. Caton and H. A. Coombs, the Engineer and General Manager and the Assistant Engineer of the Oxford Gas Light and Coke Company, will probably interest a wide circle of gas engineers—especially those who have horizontal retort-house machines, and have had the misfortune to experience a serious breakdown on account of the hoisting chains or mechanism breaking and allowing the suspended machinery to crash to the ground.

A good many accidents of this nature have occurred, some of which have resulted in loss of life; but even when no personal

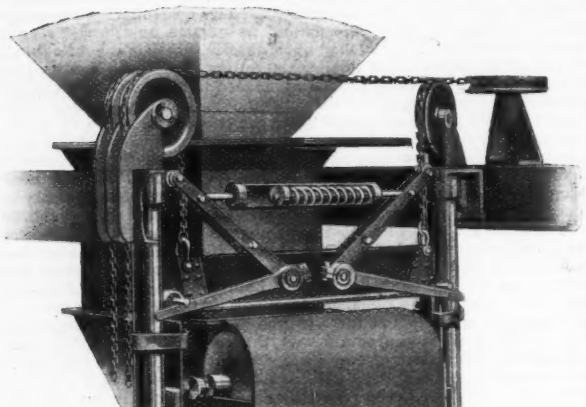


Fig. 1.—Safety Device adapted to a De Brouwer Charging Machine.

injury has been caused, the breakdown has generally been of a very serious nature, necessitating throwing the machine in question out of action for several days, or even longer, if the makers are

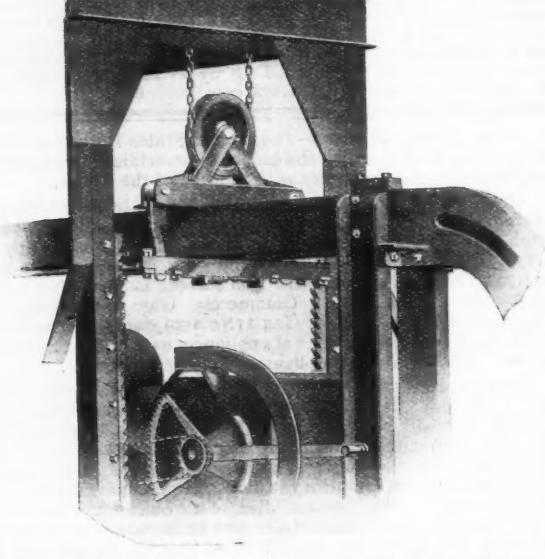


Fig. 2.—Safety Device adapted to a De Brouwer Discharging Machine.

not able to supply the requisite spare parts from stock. Should a discharging or combined machine crash, and it become necessary to revert to hand drawing, it will be found a most difficult and prolonged process to draw the machine-fed charges, owing to the inability of the stoker to get his rake over the top of the charge.

The accompanying illustrations show two designs of safety device, one adapted to a "D.B." charger, the other to a "D.B." discharging machine. In both cases the device is operated by means of a powerful spring, but is prevented from functioning under normal conditions by the tension of the suspending chains or steel rope, as the case may be. Immediately the tension of the suspending chain or rope is lessened, as would occur in the case of a break, the safety device immediately functions under the power of a strong spring.

On referring to fig. 1 it will be seen that the method of adapting this principle to the "D.B." charging machine consists of a hardened steel roller having a milled surface, which acts as a sprag between the main guides of the machine and the suspended frame. Immediately the tension of the suspending chain is reduced, as it would be in the case of a fracture of the chain, this sprag is driven into position by the spring-operated levers on which it is supported.

Fig. 2 shows the principle applied to a "D.B." pusher; but with slight modification it can be adapted to almost any type of pusher or combined charger and pusher. In this case, the safety device consists of a set of steel jaws, which engage, when they operate, in a rack secured to the framework of the machine. Under normal conditions, levers hold the jaws just clear of engaging the rack, and against the tension of a powerful spring. In the event of a chain breaking, the spring would immediately drive the liberated jaw into the rack, and prevent the hanging frame from falling.

There is no doubt that many gas engineers and managers will agree that these safety catches meet a long-felt need by strengthening a weak spot in the most vital machinery in a gas-works.

The manufacture of these safety devices has been entrusted to Messrs. Ride and Bell, Ltd., of Misterton, Notts.

MIDLAND JUNIOR GAS ASSOCIATION.

A Meeting of the Association was held at the Birmingham Council House on March 22. Mr. C. F. Rendle (the President) occupied the chair.

Dr. J. G. Stewart (of the Sigma Instrument Company, Letchworth) read the following paper—illustrated with recorder and blackboard sketches—on

WORKS INSTRUMENTS AND AUTO-CONTROL OF CALORIFIC VALUE.

I propose talking to-night on developments in works control instruments, dealing in the first place with the "Sigma" B.Th.U. recorder, which has only recently emerged from the experimental stage. Thereafter I wish to deal with the problem of automatic control of calorific value—a subject which so far has not been discussed by gas engineers.

The "Sigma" B.Th.U. Recorder.

Like the "Sigma" indicator, the recorder depends on the expansion of a steel tube heated by the gas under examination, measured in relation to a comparison tube, also of steel. As considerably more expansion is required in the recorder to give the necessary forces at the pen, the expansion tube system does not consist only of the expansion tube and the comparison tube, but there is a third tube between these which keeps the comparison tube cooler than it would otherwise be. These are surrounded by an outside shield tube, which protects them from draughts and also carries the burner. The magnification of the relative expansion is done by a system of levers; the first one being operated by torsion pivots, as in the indicator. The remaining links and levers are proportioned to make the pen motion, with change of calorific value, agree with the scale of the chart used.

The pen is pivoted, and can either be lifted off or moved to the side, when renewing a chart, without disturbing the working of the instrument. The gas-flow regulator consists of two pressure governors. The upper one is what is usually understood as a pressure governor; the lower one being more like a relief or escape valve, the valve of which opens only if the pressure has reached that to which it is set. Actually there is no escape, as all the gas leaving it passes to the burner of the recorder. The value of this lower governor is that it makes the lower regulator a unit in itself, and independent of the suction at the burner and of the distributing effect of viscosity in the pipe leading to the burner. The only viscosity left is that in the ½ in. bore pipe between the two governors, which is negligible. This pipe and the valves of the governors can be easily withdrawn for cleaning. The pressure in the top governor is 0·33 in. and in the bottom one 0·25 in., giving a difference of 0·08 in.—practically that owing to the air between the two levels. If air were passed through the regulator, the whole pressure drop of 0·08 in. would take place in the orifice; but if gas (which has a specific gravity less than that of air) is passed through, part of the pressure difference is lost in passing from the upper to the lower levels, leaving only a fraction available to make the gas flow through the orifice. As gases of low specific gravity flow through orifices more easily than those with higher specific gravity, this reduction of pressure is necessary to maintain a constant volumetric flow.

When we come to the effect on the flow of change in the tabular number, we have to obtain quite a different result. If we suppose the quality of the gas to remain constant, its calorific value will remain constant whatever the atmospheric density. To keep the instrument reading constant, the British thermal units passing per minute to the burner must be constant, so that (which is the same thing) the weight of gas flowing per minute must be constant. To achieve this result, the product pressure drop in the orifice density of the gas flowing through it must be constant, so that a 4 p.ct. rise in density will require, roughly, a 4 p.ct. diminution in the pressure drop.

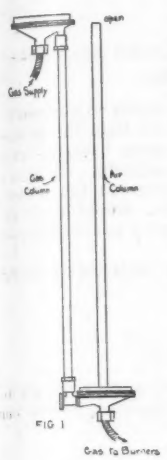


FIG 1

Without going into the matter mathematically, we can see that the flow regulator gives this result. Consider the regulator as a U tube (as in fig. 1), being an open tube, which we imagine placed on the cover of the lower governor. Suppose, initially, we have gas of sp.gr. 0·5 flowing through the orifice, and that the pressure drop in the orifice amounts to 0·04 in. A rise of density of the air of 4 p.ct. will mean an increased weight of 4 p.ct. for both the gas and the air limbs. The air limbs will give an increased back pressure of $\frac{1}{25} \times 0{\cdot}08$ in. $= 0{\cdot}0032$ in., and the gas column will produce a forward pressure of half this amount (0·001), so that the pressure drop in the orifice is lessened by 0·0016—exactly 4 p.ct. of the 0·04 original pressure drop.

Mr. J. W. Wood, in his analysis of the Simmance regulator, has shown that regulators of this type give their best results at a sp.gr. of 0·5, and that the correction is not nearly so good for very low or very high values of sp.gr. Fortunately for average values of sp.gr. and for ordinary ranges of atmospheric temperature and pressure very close correction is obtained.

We now come to the interesting problem of automatic control of calorific value. Mr. G. M. Gill discussed, in a recent article in the "GAS JOURNAL," the difficulty of the maintenance of a constant calorific value as one particularly hard to overcome in small gas-works. A common fluctuation of the gas supplied by a small works is 50 B.Th.U.; and Mr. Gill states that it is sometimes as high as 100 B.Th.U. If a small works were working under the Gas Regulation Act with a declared calorific value of 500 B.Th.U., and keeping above it, one may estimate an average supply of (say) 7½ p.ct. more therms than stated on the consumers' bills. If the works in question made 20 million c.ft. of gas in the year, and sold it at 6s. 6d. per 1000 c.ft., their income from gas would be £6666; and if they supplied 7½ p.ct. uncharged therms, their value would exceed £450. The consumer must pay by giving a higher price per therm for the therm actually charged to him. But the dissatisfaction of the consumer with the high price will not tend to increase gas consumption or the sale of appliances in the district; so that, if possible, the price of gas per therm must be kept low. If the managers of small gas-works can succeed in lowering their price, and supplying gas of more constant quality, their prospects of increased business will become exceptionally good.

My interest in the problem is confined to the possibility of the automatic control of calorific value. In a paper read before the London and Southern District Junior Gas Association, by Mr. W. H. Warren,* of the Shoreditch Works of the Gas Light and Coke Company, a suggestion was made that the retort-house governor may be automatically controlled by the movement of a recording calorimeter which makes electrical contacts at two limiting positions—a current in the one wire permits the loading of the governor with water, while a current in the other unloads it. The method has not been tried; but it is probable that it has the defects of electrical devices used for automatic control—namely, that of "hunting" (that is, producing large fluctuations above and below the required value). If gas pressure is used in place of electricity, we can make the calorimeter produce pressures which vary continuously over the permissible range of the calorimeter. By making these pressures act on the retort-house governor, its loading could be definitely related to the reading of the calorimeter; and the final adjustment to eliminate hunting, if it did appear, would be easy. The method outlined above, with the calorimeter placed at the exhauster, as shown by Mr. Warren, would be unsuitable for use with horizontal retorts in a small gas-works. By placing the calorimeter on the town supply, some improvement in constancy of calorific value may be obtained; but the method is open to objection—that it may lead to overpulling, with consequent troubles. Instead of interfering with the retort-house governor, the action of a calorimeter on the town supply may be made to open and close a valve admitting air or a low calorific value gas at (say) the inlet side of the exhauster. Such a method would be simple; but the closeness of control would be limited by the large volume of gas between the exhauster and the calorimeter. There remains the possibility of mixing a low calorific value gas with the better gas from the holder, on the town side of the holder. In a very rough way, and with very small gas flows I have made an experiment to see whether the scheme is practicable, and not liable to hunt. The experiment was satisfactory, and I am of opinion that the problem of obtaining stable working without any tendency to hunt would be simpler in practice than it is with experimental apparatus and small flows.

* See Vol. CLXI., p. 619.

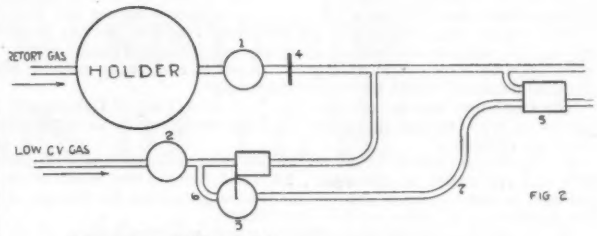


FIG 2

1. Governor on holder outlet.
2. Low C.V. gas supply.
3. Automatic valve with bell for operating it.
4. Plate with large hole in it causing slight pressure-drop between governor and point of mixing of the two gases.
5. Calorimeter controlling escape of gas through pipe 7.
6. Pipe with orifice for supplying gas to bell 3.
7. Pipe for relieving pressure in bell 3.

The diagram (fig. 2) shows the gas-works arrangement corresponding to my experimental apparatus. The low calorific value gas passes through a governor 2, adjusted to the same pressure as that of the governor 1 on the outlet of the holder. After leaving the governor 2, the gas passes through the automatic valve 3, whose opening is controlled by the calorimeter 5, to the junction where it is mixed with gas from the holder. Gas from the holder, after passing through its governor, flows through a plate 4 (with a good-sized hole in it), after which it is mixed with the power gas. The reason for adjusting the two governors to equal pressure, and for introducing the orifice at 4, is to ensure that the ratio of the volumes in the two pipes remains constant whatever fluctuations should take place in the demand. Since pressure governors are mostly defective at small flow, there is something to be said for setting the governor on the low calorific value supply to a pressure slightly below the other, as this would allow almost pure holder gas to pass during periods of very low demand.

The automatic valve 3 is operated by gas pressure. Gas is led by the pipe 6, which contains an orifice, into the liquid-sealed bell which forms the operating piston of the automatic valve 3. A second pipe 7 passes from the bell to the calorimeter 5, the action of which stops or permits the flow of gas from the bell, thus determining the pressure of gas in the bell and the opening of the automatic valve. If instead of adding the low calorific value gas on the town supply side of the holder, it is added at the exhauster, the automatic valve would still be required, and the arrangement would be that shown diagrammatically in fig. 3.

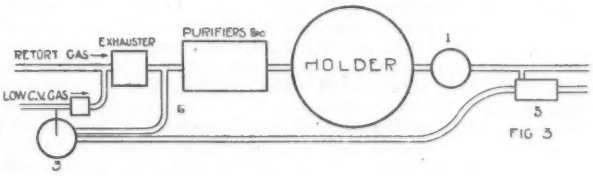


FIG 3

1. Governor on holder outlet.
3. Automatic valve with bell for operating.
5. Calorimeter controlling escape of gas from pipe 7.
6. Pipe with orifice for supplying gas to bell 3.
7. Pipe for relieving pressure in bell 3.

The idea of mixing a low calorific value gas with retort gas to keep the calorific value constant is at present in very extensive use by gas undertakings making water gas; but as mixing without an automatic valve on small gas-works generally produces a gas with fluctuations still of 50 B.Th.U., some automatic control appears to be necessary. How constant one could maintain the calorific value using either scheme (fig. 2 or fig. 3), can only be determined by a trial on a gas-works. It should be pointed out that fig. 3 scheme, if it could be adjusted to give a sufficiently close control, is much the simpler, since the two gases pass through the same washers and purifiers; whereas with fig. 2 scheme some additional purifying apparatus would be necessary for the low calorific value gas, if gas were used. If air were used, the same difficulties would not arise.

I have outlined the method I think most likely to give satisfactory results. There are probably other means which have not occurred to me. I should like to think that my introduction to the problem will stimulate gas managers to tackle it; for, by its nature, it is not one that can be fully solved by a scientific instrument maker in his workshop.

Discussion.

The general discussion was rather of the conversational type, and had relation largely to the blackboard diagrams.

The CHAIRMAN said the contribution was unquestionably of considerable technical interest, and to those engaged on the works side of the industry made a strong appeal. Personally, he thought there should be some device which would automatically load and unload the retort-house governor. A point to be considered in the design of horizontal settings was, he thought, that they should be capable of

being charged much more regularly, so as to keep the throughput line constant. The maintenance of a more regular coal throughput was most valuable. He thought men engaged on small works would welcome some apparatus to maintain a constant calorific value.

Mr. L. H. Thomas (Nechells), in moving a vote of thanks to the author, inquired if the insulating tube were of such a nature that after a while its efficiency might become impaired. Had Dr. Stewart found any deterioration in the tube? In these days when there were limitations upon holder storage, he shared the belief that some method of automatic control would be of great advantage.

The resolution was seconded by Mr. J. H. Gee (Central Laboratory, Nechells), who inquired as to the accuracy which could be expected from the recorder.

Mr. C. Ward (Knowle) said the holder inlet at Knowle was on one side and the outlet on the other; he found the gas was much more constant in consequence. As to retort-house governors he thought it was possible to do better work without them.

Mr. E. Arthur (Birmingham) thought that on large works, where one had to supplement the output by water gas, this investigation in relation to automatic control was worthy of much closer attention. With a constant vacuum at the exhauster, it seemed to him that there was not much need for the retort-house governor.

Mr. W. E. Cadwallader (Birmingham) said it would be generally admitted that there was a fair amount of streaky gas; and he suggested that the interposition of a mixer would lead to greater uniformity. From a distribution point of view, a constant calorific value was most important.

Mr. Adlington (Worcester) did not share in the views expressed regarding the retort-house governor. With reference to the Sigma indicator he had nothing but praise to give.

Mr. Myhill emphasized the need for keeping a close eye on the composition of the gas. The use of what he termed "genuine" gas only would add greatly to the cost of small works; apart from the question of corrosion he was opposed to having more oxygen in the gas than could be avoided.

Mr. Currier (Smethwick) observed, with reference to the automatic device, that in his opinion the aim should be, if possible, to make a straight gas without any diluent at all. The calorific value should be regulated from the retort-house.

The vote of thanks was carried, and Dr. Stewart briefly replied. He pointed out that the internal tube showed no sign of corrosion, and he had not found any deposit. The insulating tube was of steel, and there was no deterioration. He thought there was a possibility of some scheme such as he had suggested being of use where water gas was made.

Annealing Steel Castings with Gas.

The Denver Gas and Electric Light Company recently inaugurated an intensive industrial gas campaign, which has led to some surprising results. As an example, Mr. C. E. Muchberg, the Company's Industrial Engineer, quotes in the "American Gas Association Monthly" the conversion to gas of two car-type annealing furnaces at a foundry which produces the highest-grade steel and iron castings for general railroad use. The smaller furnace has an approximate capacity of 3 tons of castings per charge, while the larger one will handle as much as 12 tons. In making the conversion to gas fuel, it was arranged to maintain a uniform pressure of 20 in. of water. The smaller furnace was equipped with two blast burners of the air-injector type, and the larger one with four similar burners, all inserted in the old oil-burner ports. Separate motor-driven blowers were installed. Previous to the fitting of the gas-burners, a test was conducted on the old oil-burner equipment, to determine the oil consumption per ton of the different grades of steel castings annealed; and similar tests were made after the change-over. The average results of the tests were:

	Medium Carbon Steel.	Manganese Steel.
Conversion ratio: $\frac{\text{B.Th.U. of gas}}{\text{B.Th.U. of oil}}$	= 1 : 2·14 ..	1 : 2·04

From the results obtained, he says, it can readily be seen that gaseous fuel, when correctly applied, has a wonderful advantage over oil. Likewise, by proper application, economies may be effected which will make the use of gas thoroughly competitive with oil from a general cost standpoint, without consideration of the many other characteristics which tend to make gas the more desirable fuel.

Nitrogen Fixation Processes.

In an article appearing in "Chimie et Industrie," M. Maurice Deschiens, referring to systems for the production of synthetic ammonia, says that the advantages of the Claude process are fairly well known; but it may be remarked that per gramme of catalyst the Claude process yields 6 grammes of ammonia against 0·5 produced by the Haber process. The gas has to be passed only four times over the catalyst to produce the same effect as the Haber process in fifteen days. In addition, the Claude process can be utilized wherever coke-ovens are present; and the plant is much smaller and cheaper to instal. According to a report by the Director of the Service des Poudres to the Finance Committee of the French Chamber of Deputies, the Casale process has given extraordinary results. Improvements, however, are being made in all the processes for fixing nitrogen; and provided no system is unduly favoured, actual commercial competition will finally decide which process or processes are to remain.

SOME NOTES ON THE BUNSEN BURNER.

By J. G. Clark.

[A Paper read Friday, March 23, before the London and Southern District Junior Gas Association.]

It is recorded of Pliny that at the end of a letter to a friend he apologized for its length and said he had no time to write a shorter one. I felt the force of this remark when I was pruning this paper to the dimensions of this evening's agenda. All of you must have realized the many avenues of research the bunsen burner offers to us. Their mere enumeration would make an interesting paper. On this occasion it is intended to take a glance down only one of the avenues.

For convenience, the bunsen burner may be regarded as having three parts:

1. The injector or gas-jet.
2. The mixing-chamber.
3. The burner-head.

The data in the diagrams show the distribution of pressure in the combustible mixture at various parts of a drilled-type boiling-ring for three different gas rates.

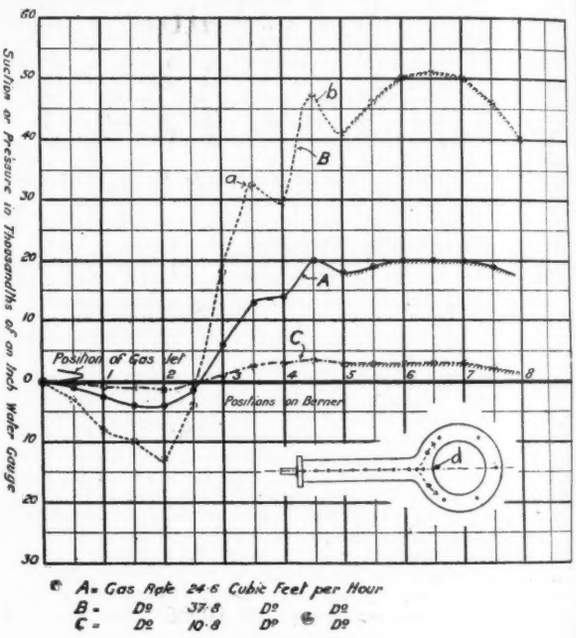


Fig. 1.—Data re Boiling-Ring.

The points on the curves correspond to the points on the inset diagram. The peak *b* shows the pressure where the gas-air stream divides at *d* (inset); and the parts of the curves that are shaded show the pressures, found at the points indicated in the circular burner-head (inset) taken in a clockwise direction.

Consider fig. 1. The gas-jet and air-port apertures remained unaltered during the experiment; the only variable being the rate of gas consumption. The curves are divided into two parts—positive and negative—by the atmospheric line. Several things may be observed. For instance, the mean negative values will be found approximately proportional to the squares of the rates of gas consumption; or (which is the same thing) the potential auto-aerating power of the gas is nearly proportional to the gas rate, thereby tending to a constant percentage of aeration of the burner-head mixture for all gas rates within the capacity of the burner. In practice, there is a slight lowering of the aeration when the gas rate is reduced. This is a practical advantage, for it gives stability to the smaller flames. Notice the flatness of the curves where they are shaded. This conduces to uniformity in flame lengths. The almost exact coincidence of the three curves at their points of juncture with the atmospheric line is interesting. I think it was Mr. Thomas Fletcher who first stated the rule that a flame orifice of a bunsen burner should not be nearer to the injector than four diameters of the mixing-tube—a rule confirmed by fig. 1. A flame could not burn at a point where the pressure is negative, although a positive pressure of only a few thousandths of an inch is sufficient to prevent its retiring into the mixing tube. The peaks are interesting. The one marked *a* was due to an excrescence on the casting, and shows how irregular lengths of flames might be caused by careless work in the foundry. The second peak *b* was due to the impact of the mixture at *d*, where it divided into two streams (see arrows fig. 1 inset). It will be observed that the relation between the curves in the negative region of fig. 1 occurs again in the positive region.

Now consider fig. 2. It contains curves similar to those in fig. 1. The same burner was employed; but the excrescence that caused

THE LOW TEMPERATURE CARBONIZATION OF COAL.

"We cannot ignore the fact that the widest and most natural outlet for the rich gas from low temperature carbonization is as an enriching agent for raising low grade gas to a higher Standard of Calorific Value."

Vide Report of the FUEL RESEARCH BOARD, 1920—21.

For the large yields of gas per ton obtainable from horizontal retorts or steaming in vertical retorts

8·5 p.ct. of low-temperature gas of 1000 B.Th.U. will raise 25,610 c.ft. of 432 B.Th.U. gas to a town's supply of 480 B.Th.U.

25·7 p.ct. of low-temperature gas will enrich blue water gas of 300 B.Th.U. to a town's supply of 480 B.Th.U.

When oil is used as an enricher it is gasified without the production of bye-products; but with low-temperature gas used for enriching purposes there are valuable assets in the form of smokeless fuel (Coalite) and large yields of oil. There is also a considerable saving in the total coal carbonized and in the cost of the therm delivered into the gasholder.

Low Temperature Construction, Limited, are now prepared to erect complete installations.

Low Temperature Construction, Ltd.,

63, Lincoln's Inn Fields, W.C. 2.

GODIN'S STOVES

Telegrams: "AMOUR, LONDON."
Telephone No.: 1890 HOLBORN.

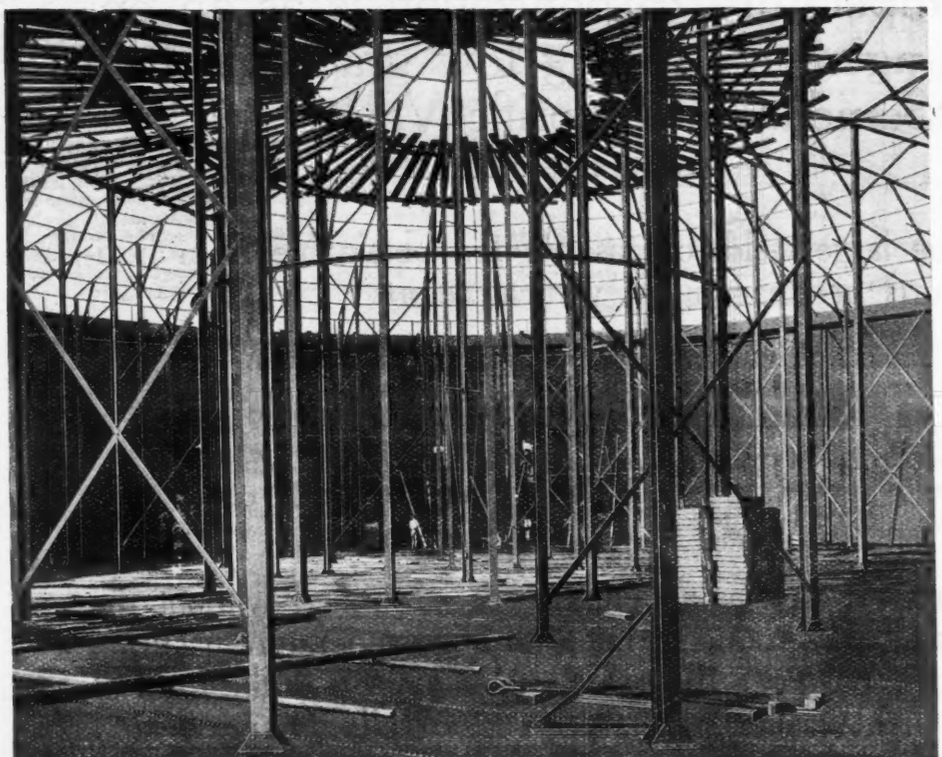
SUITABLE FOR WAREHOUSES, WORKSHOPS.

Heating Capacities to 100,000 Cub. Ft. for Burning Coke & Anthracite

CHEAPEST HEATING.

Those for Living-Rooms can be ENAMELLED WITH INDESTRUCTIBLE ENAMEL.

A. G. CLOAKE, 54, Holborn Viaduct, LONDON



GAS HOLDERS
WITH OR WITHOUT
STEEL TANKS
WITH
GUIDE FRAMING
OR
SPIRAL GUIDED
WITH
MILBOURNE
PATENT
SELF LUBRICATING
ROLLER CARRIAGES
AND
"MILCOT"
PATENT
LADDERS

VIEW INSIDE STEEL GASHOLDER TANK DURING COURSE OF ERECTION. Diameter of Tank, 172 ft.; Depth, 32½ ft.

C. & W. WALKER, LTD., DONNINGTON, NEWPORT—SALOP.

LONDON OFFICE: 110, CANNON STREET, E.C.4.

WATER GAS PLANT.

ECONOMICAL GAS APPARATUS CONSTRUCTION COMPANY, LIMITED.

36, Victoria Street, London, S.W.

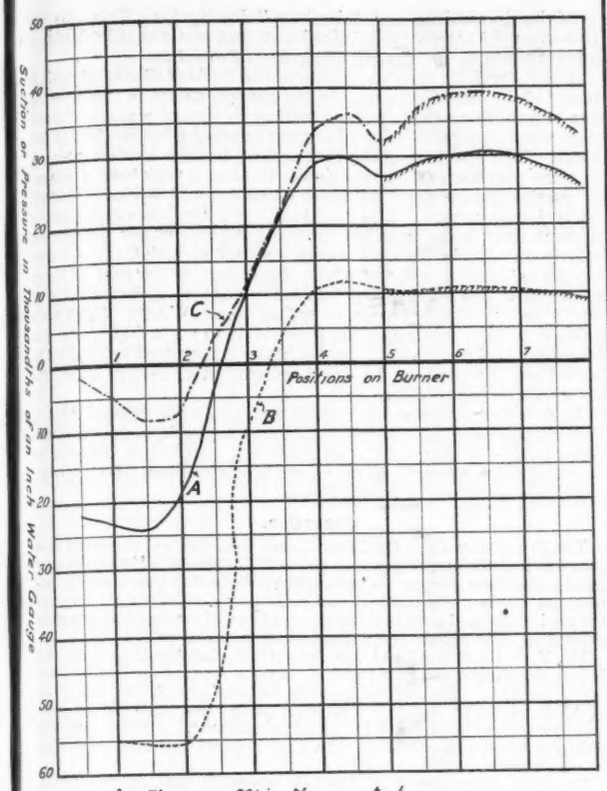


Fig. 2.—Data *re* Boiling-Ring.

peak *a* had been removed. The only variable was the area of the primary-air port. The gas rate was kept constant at 24·6 c.ft. per hour. Notice that by creating high vacua when the primary-air port was reduced, the gas-jet tried—though in vain—to entrain sufficient air. The coincidence of the curves at the atmospheric line observed in fig. 1 does not appear in fig. 2. The explanation is that although in fig. 2 the energy of the gas-jet remained unchanged, each curve represents a different percentage aeration of the mixture in the burner. The mixtures varied in volume and density; that is, the mass was different in each case, thus being in contra-distinction to the conditions indicated in fig. 1, where the density of mixtures was practically the same for all three curves, and the mass was nearly proportional to the gas rate. The creation of negative and positive pressures in bunsen burners is due, of course, to the kinetic energy of the gas-jet. It is interesting to notice in fig. 2 that if the area enclosed below the atmospheric line by each of the curves is added to the area enclosed above the atmospheric line, a value which is very nearly constant for all three curves is obtained; that is, the work done at negative pressure *plus* the work done at positive pressure, is nearly the same for all three curves. This might have been anticipated because of the constancy in the source of energy—the gas-jet—but experimental confirmation of any supposition is always helpful.

In considering fig. 2 it is important to remember that the primary air was controlled by varying the area of the air-port. There are at least five ways of varying the proportion of primary air in bunsen burners.

1. Variation of area of primary-air port.
2. Interference of the gas-jet by, for instance, a small screw or other means.
3. Variation of resistance of mixing-tube.
4. Variation of resistance of burner-head.
5. By allowing a small and adjustable amount of gas to trickle into the primary-air port.

The first method is the one alluded to in figs. 1 and 2. Method No. 5 is adopted in the Keith silica lamp; and, as it introduces a chemical factor, it is distinct from all the others, which are purely physical. All these methods of air control (except No. 1) would give curves different from those illustrated in the diagrams. Not only would the forms of the curves be different, but the relation to each other of curves representing high, normal, and low aerations would be different too. These other curves, so far as I know, have yet to be obtained, and therein lies an opportunity for someone.

I am only too conscious of the incompleteness of this paper. Its purpose is to draw attention to a branch of work that is very interesting, and, when further pursued, is likely to reveal information of some value in burner design.

Discussion.

Mr. Clark remarked that in this paper he had tried to disclose some of the things that happened inside the bunsen burner, and which were therefore perhaps not very well known.

The President (Mr. D. Cleave Cross) declared that the matter the author had brought forward must have taught them all a tremendous lot. The bunsen burner was a seemingly simple thing, with which practically every distribution man had to deal in some way or another; and it would pay every member to study the paper carefully. When they came to consider all that happened inside it, they would realize how much there was in the designing of the bunsen burner. The knowledge to be gained from the paper would also help them to get over many of their troubles. Unfortunately the time available for discussion was very short; but no doubt more had been gathered from the paper itself than would be possible from any amount of talk.

Mr. D. J. Winslow (Lea Bridge) asked what would be considered as the normal consumption of the gas-ring referred to in the diagrams. He had been up against a problem lately which was affected by the paper—that was, how to introduce more than the usual amount of primary air, and so get a very high flame temperature. This was in connection with a small fish-frying shop which did a very big trade. The proprietor had used coke, but had changed over to gas and provided himself with first-class burners. He could not, however, cook the fish sufficiently quickly. Now he (Mr. Winslow) had fitted up a burner of the furnace type, which had greatly reduced the time required for cooking.

Mr. F. S. Larkin (Gas Light and Coke Company) agreed that to those of them who had to deal with burners in every-day life, this was a most important paper. They had had a rough idea of the conditions that existed inside the bunsen; but to have everything set out in this deliberate and careful manner must be a great help. With reference to Mr. Winslow's remarks, had he tried putting a very good venturi on his burners?

Mr. W. L. Westbrook (North Middlesex Gas Company) alluded to the five ways of varying the proportion of primary air in bunsen burners, as set out by the author, and inquired whether No. 2 method included alteration of the position of the injector itself in relation to the air port. This might be a sixth method of controlling the air supply. Had Mr. Clark made any experiments which would enable him to state which was the best method of controlling the air supply?

Mr. L. Lacey (Gas Light and Coke Company) asked how the very small pressures shown on the diagrams were measured.

Mr. Clark, in reply, said that 24·6 c.ft. was intended to be the maximum consumption of the gas-ring; but he should call it a 25 c.ft. per hour burner. What did he consider the best method of regulating the air? Well, this was rather a leading question; but he would be inclined to say himself that the method most likely ultimately to prevail in bunsen burner design would be the one that interfered with the gas-jet, or the one that interfered with the resistance of the burner tube. The others all carried out the adjustment quite well; but, considered practically, he thought No. 2 or No. 3 in the list would prevail in the long run. He had purposely omitted from the paper any description of the methods adopted by him in conducting his investigations. What he did was to use a very delicate micrometer gauge, and a large bell very light and immersed in oil. The height to which the bell rose out of the oil depended on the pressure. If the area was very large, one could get a movement up and down with very slight alterations of pressure. To magnify this movement, one needed a very long and light pointer.

THE FLUE OUTLET.

By H. W. Kerridge, of Croydon.

[A Paper read on March 23 before the London and Southern District Junior Gas Association.]

It will be generally agreed that, next in importance to the sales of gas, is the question of the successful disposal of the products of combustion, particularly as regards domestic heating appliances—and never more so than at the present time. The various and diverse conditions involved in the general practice of flue ventilation must preclude any dogmatic ruling. The following brief remarks will therefore be directed to some of its aspects, and as applied to small and middle-class residential property, new developments of which are to be observed on all sides.

Undoubtedly, the ideal method is to be found in the ordinary 9 in. by 9 in. brick chimney flue, the brick "cavity" flue, or more modern "built-in" settings, all of which should, of course, terminate at the correct height. With some builders of the speculative type, there still exists a hazy idea as to what constitutes a really effective gas flue and outlet. The practice of terminating with an ordinary air grating or open terminal, at any point below the eaves, cannot always be relied upon to function successfully. Yet such practice, involving results more or less unsatisfactory, is frequently to be met with. In this connection, the writer would suggest that the various claims for such methods of discharge should, at all times, be strictly qualified.

In view of the sluggish pull found to obtain with some chimneys, and in newly-built houses, one can but assume the local building bye-laws are not so strict concerning flue construction as they might be. Quite recently the writer had occasion to inspect two separate cases of complaint involving troublesome chimney flues. In the one a "cavity" flue was found to be completely sealed, and in the other there was an almost total stoppage, both entirely due to mortar that had fallen during construction. Hence a more generous, or compulsory, application of the principles of the "coring hole" would be an undoubted advantage.

In considering a case where, for one reason or another, an ordi-

nary chimney flue is not available for use, one has the alternative choice of either the open air or the roof space—both, however, involving conditions as varied as they are uncertain. Let an example be taken where a flue outlet is discharged through the wall and into the open air, and with the conditions obtaining with the wind blowing strongly and directly on to this wall. Here at once is set-up a resistance to the wind stream, and what, for want of a better term, one would describe as a "piling-up" of the atmosphere—consequently a local increase in atmospheric pressure. Such increase, though comparatively slight, is quite sufficient to overbalance the static pressure obtaining within the house. Hence the discharging of a gas-flue outlet through the wall, and directly into such conditions, must result in a free and uninterrupted rush of air into the room. The simple expedient of opening the window—if also facing the wind stream—and closing the door of the room, will at times effect a state of balance. Apart from such means, one has yet to discover a flue terminal, other than mechanical, which may, under the foregoing conditions, be guaranteed to function successfully. If circumstances compel the "open air" method of discharge, there should be no hesitation in extending, within reasonable limits, to a point above gutter level, and for preference with a terminal of the silent revolving type. Being more or less in the main wind-stream, such a terminal must function to better advantage. If, however, the roof is of very steep pitch, conditions approaching the vertical will begin to obtain, with possible wind pressure difficulties.

The practice of discharging the flue outlet into the roof space, though admittedly not the ideal, is at times the only alternative or better choice. Provided the roof space is of the "open" type, favourably situated, and unlikely to be required for storage, no great harm can result through its being used for ventilating purposes. Under certain conditions it is possible, of course, for the wind to enter a roof space at a greater rate than it can be discharged, with resultant accumulation and pressure. Such conditions will be met with in an ordinary "lean-to" roof, or one consisting of three sides. With the latter type, it is quite possible for the wind to be blowing upon, and entering in, on two sides at once, leaving only the third as a means of discharge. A "hip" or four-sided roof will be found more effective; for while the wind can enter on two sides, equally there remain two for discharge. A "span" or two-sided roof also has alternative means of ingress and exit. Under abnormal conditions, however, it is quite possible for this capricious element to enter a roof space at a greater rate than it can be discharged, with consequent pressure of varying intensity.

As is well known, the aero-motive force exerted upon, and round, a building must naturally cause a "pull" of corresponding degree upon the opposite or "lee" side. With high-velocity winds, and under certain conditions, there must result a partial vacuum, or, to borrow an aviation term, cavitation, and of sufficient intensity at times seriously to disturb the ordinary and peaceful functioning of the domestic chimney. A clear instance of such conditions came under the writer's notice a short while ago. Owing to the peculiar lay-out of the property, there obtained between two blocks of houses a passage way of bottle-neck formation. It will be readily appreciated that, with the wind blowing strongly from a direction facing such an opening, there must result in its journey through and emergence a considerable acceleration in its velocity—sufficiently intense, in the case under notice, to draw the smoke emerging from a neighbouring pot down the flue and out through the open door of the house adjoining the passage-way. This intermittent, though unmistakable, action, which ceased on the door being closed, constituted not a "down-blow," but a "down-pull," and one of no mean degree. Bearing in mind the "jig-saw" lay-out of various classes of property, such conditions must obtain in like manner, and far more generally than is supposed, forming in many instances the contributory cause of a flue outlet difficulty.

Closely allied to the subject of the flue outlet is that of condensation—particularly as regards water heating appliances, the products of combustion from which are essentially low in temperature and heavily laden with moisture, a factor which renders their successful discharge susceptible to the slightest wind contrariness. Such adverse conditions as would obtain in a cold, lofty, and perhaps damp chimney, wherein is discharged the flue from a water heater, will naturally result in the deposit of condensation, with ultimate damage to the apparatus, the flue piping, and possibly the house decorations adjacent to the flue. The writer some time ago investigated one such case—fortunately rare—of damaged decorations, caused solely through the condensate resulting from the use of a gas circulating boiler penetrating the wall of a chimney flue and affecting a large area of wall-paper in two rooms. In all such instances sluggish chimney pull, combined with porous brickwork, will be found to be the cause. Hence the first consideration must be to effect, as speedily as possible, disposal of the products of combustion.

Pipe renewals have in the past greatly added to the maintenance costs of various water-heating appliances; and there does not appear yet to be any metal, reasonable in cost, capable of withstanding the disintegrating influences of gas products of combustion. The writer has under close observation at the present time a quantity of flue piping made up in "Monel" metal. Though a rather costly material, it is very neat in make-up, and of great acid-resisting qualities. Its general utility has, however, yet to be proved. Another flue material becoming increasingly popular is of the composition or "Asbestone" description. This bids fair to outlast the stoutest galvanized iron flue, and has the additional advantage of being a ready absorbent of moisture.

A few words on the thorny side of the flueless heater will not, it is hoped, be out of season. In the general desire to increase the gas output, there exists the temptation to secure a class of business which, on quiet reflection, would, perhaps, be far better left alone. The specious claim that certain flueless heaters possess, in some peculiar manner, the power to absorb their own products of combustion, and are therefore odourless and hygienic, cannot be seriously upheld. The fact that such appliances are, at the present time, being installed in positions, and under conditions, utterly unsuitable, each constituting a bad advertisement for gas, should sufficiently warrant a wise discretion on the part of every responsible gas official—remembering that if a commodity is worth selling at all, it is worth selling well. Within the writer's area of supply, the invariable practice is to report specially and investigate all cases where flueless heaters or geysers are known to have been installed—every effort being used to secure their efficient ventilation or removal.

In conclusion, the writer would suggest, as a general axiom, that no domestic gas-heating appliance should be installed where there exists the slightest risk of inefficient ventilation, bringing as a consequence the good name of gas into disrepute. To apply an old adage—"When in doubt, don't."

Discussion.

The PRESIDENT (Mr. D. Cleave Cross, Lea Bridge) remarked that this was just the sort of paper to promote discussion. No matter how good a circulator, fire, or cooker might be, if the flue outlet was ineffective, the whole thing must be unsatisfactory, and must do harm to the gas industry. It was therefore a detail to which must be given close attention. The author had pointed out difficulties liable to arise.

Mr. F. S. LARKIN (Gas Light and Coke Company) said he had hoped the author was going to give them a method for getting over these troubles. District men would be very grateful to him if he could do so. The author had referred to the excessive pull or push through certain buildings. If he had succeeded in getting over the difficulty there, it might be found a key to some other cases of trouble on the district.

Mr. D. J. WINSLOW (Lea Bridge) assumed that, in mentioning "Asbestone," the author intended to include the new preparation "Uralite." In some cases his Company had used rain-water pipe; but even then, in the case of wash-coppers, &c., rust came down, which was apt to be very troublesome. They had therefore just adopted "Uralite" to meet the circumstances. He was wondering whether the moisture would be likely to cause disintegration. How had the author dealt with the case of the circulator flue being led into the ordinary chimney, and where condensation appeared through the walls? With regard to the flueless heater, he himself actually knew of two doctors who used them—one in his waiting-room, and the other in his sitting-room.

Mr. W. L. WESTBROOK (North Middlesex Gas Company) expressed agreement with the author in the main. He asked what his opinion would be as to the possibility of down draught on a still day, with severe frost, in the case of the pipe running right up outside the house. Personally he found, as a rule, that the roof space was quite reliable, though sometimes it was necessary to be careful.

Mr. J. G. CLARK (Gas Light and Coke Company) referred to the question of cowls as presenting a very serious trouble. They never took into account the piling-up of pressure against the wall. He had often thought the time might come when some sort of twin flue pipe would have to be provided, one from the top and the other from the bottom of the apparatus, so that the air going into (say) the circulator would be at about the same pressure as the products coming out. He could not see any conceivable way of overcoming the difficulty otherwise, except by carrying the flue pipe ever so high. The corrosion of flue pipes was a very important matter, more particularly with water-heaters, because there they had to deal with wet products of combustion, as distinct from dry products from gas-fires. On this account there was less heat in the chimney to create an up draught; and, on the other hand, there was the formation of wet films on the flue pipes, which enormously accelerated the corrosion. He was some time ago connected with experiments which showed that galvanized pipe was the very last thing to be used. Steel coated with lead was tried, and was all right up to a point; but the difficulty was to get it completely coated. If even slightly scratched, it not only did not prevent the trouble, but enormously increased it. Of "Asbestone" he had a high opinion, and thought it was likely to become the most satisfactory material for this kind of work. The allusion by Mr. Kerridge to flueless heaters was very opportune. It was astonishing to see the risks that people would run. Only a gas man was capable of deciding properly whether a position was a suitable one for such an appliance.

Mr. G. H. LLOYD (Gas Light and Coke Company) remarked that he had experienced great difficulty with a certain flue, and a box top had practically cured it, though not altogether. "Asbestone," he thought, was going to be the thing for hot-water circulators. The damage from condensation with water-heaters, he took it, was where the consumption of gas was large.

Mr. KERRIDGE, in reply to the discussion, stated that he had only recently begun testing "Asbestone." They had, however, had two installations in use now for twelve months, and they had proved most satisfactory. There was no doubt that this composition flue pipe was a remedy for many of their troubles. To combat flueless heaters successfully, they must get the confidence of the public. This was the only way in which they could prevent such things being installed. With regard to the damaged wall-paper incident mentioned in his contribution, for the time being it was necessary to give up using the chimney and go out into the open air with the flue. Later on, however, a coke boiler was fixed, and this kept the chimney warm, and so helped things a great deal. By using composition material,

one should secure a brisk up-take in a few minutes. He had tried box flue-tops in dozens of cases; but if the pressure outside was more than that inside, it would get in, whatever top was employed. It was a 62 c.ft. boiler in connection with which the condensation damage occurred.

THE GAS COMPANY'S SHOWROOM.

By Austin S. Stainer, of the Brentford Gas Company.

[A Paper read on Friday, March 23, before the London and Southern District Junior Gas Association.]

Though much has been written on the manufacture, chemistry, and distribution of gas, very little has ever been done to assist the showroom staff. The knowledge they acquire is usually assimilated through being more or less in touch with the subject, and from makers' catalogues. The more studious may perhaps take in various technical papers or acquire their knowledge from text books. Until recently gas undertakings had not taken the necessary steps to improve this enterprising section, and the showroom appeared to be their last consideration. Happily, this attitude has changed during the past few years; but there is still room for improvement. While some companies have not yet realized the importance of a properly fitted-up showroom, others have them but do not use them.

Of course, we all know that the primary object of a gas company is to manufacture gas; but surely it is also their duty to supply the very best advice and proper appliances for its consumption. This is the age of efficiency, cleanliness, and dispatch—the old-fashioned apparatus of yesterday being superseded by the more scientific and quicker methods of to-day. It is impossible (in spite of the efforts of the Press to do all it can to prejudice the public against its use) not to notice that gas for all purposes is becoming more universal. It is used in almost every industry and home in the country, and is found cheaper than any other fuel. This is the reason why the gas undertakings must have a real live showroom, staffed by trained men. In my opinion, it should be one of the "landmarks" of the town—dignified but homely, and with a welcome invitation to the most timid visitor.

The Need for Cleanliness and Tidiness.

The average showroom is not large enough to exhibit the numerous appliances to the best advantage, and in some cases is insufficiently staffed. Window blinds are unnecessary. Let your goods be on show night and day—gas stoves will not fade; and more sales have resulted from a glance in a window on a Saturday or Sunday afternoon's walk than is usually realized. The showroom—window included—should always exhibit a tidy and fresh appearance. We should see every kind of apparatus fixed as it would be when in general use. This is most essential, as it makes it simpler for the attendant to explain and for the customer to follow. On inquiry for a circulator, to be given a leaflet and shown the article in the medley of gas-fittings, is not good business. The majority of people do not know the difference between a circulator and a geyser. How obvious is the difference when one is shown a circulator properly connected with flow and return pipes, and the hot water flowing from the sink or bath tap.

A few notes occur to me on the other apparatus:

(1) Gas-fires should be prominent and always in good working condition, never displaying dirty or broken fuel.
(2) A flexible-tube cock should always be handy for connecting rings, grillers, and hotplates.
(3) The gas-iron (of which little is known by the general public) is always worthy of demonstration.
(4) The chief demand in the cooking line is for a stove on a stand and with a plate rack and enamelled back. All stoves should be raised from the ground by means of an enamelled stand. This should be included in the hire. I think fewer people would require their cookers exchanged if this was the case.

Maintenance of Fittings and Burners.

Maintenance of the fittings and burners in use appears to me of equal importance. The pendants and brackets can be kept fresh by the occasional application of an oily cloth. The burners should be cleaned and adjusted every week, and any deposits on the outside removed. The globes should be washed with warm soapy water. Comparison between a globe thoroughly washed and one carelessly cleaned shows after six months' use the advantage to be gained by the former method. The latter is generally of a pale brown appearance. Proper attention to cleaning of globes is more necessary with the new "Vitreosil" ware, as it seems to absorb the heat and smoke more than ordinary glass globes. The bowls and reflectors of semi-indirect fittings also call for special attention if the efficiency of the light is to be maintained; and I find that a little "Scourine" (which is a kind of soap powder) on a damp swab is the best means of keeping these in perfect condition. Silk shades are excellent when fresh and new—better no shade than one faded or shabby. The same remark applies to broken globes and show-cards. See that these are spotless, or do without them. Matches or tapers strewn about by careless attendants, or cigarette-ends thrown into the fireplace by the public, may be remedied by placing ash trays in convenient places. It is then possible to convince your customer, without fear of criticism, that the home is much more tidy and clean when gas is used.

Perhaps no other branch of the industry has suffered so much in the past from public prejudice as has gas heating. From the number of fires that the various undertakings have sent out during the last two seasons—both on hire and purchase, it appears that the "powers that be" have at last got over barriers, and have established the advantages of the gas-fire over other methods of heating. The usual excuses in favour of a coal-fire seem to be the need for something to poke, and the erroneous impression that gas costs more. These answer themselves.

The Desirability of Good Inter-Departmental Communication.

The general duties of the staff are more numerous at a branch showroom, where they deal with all matters, including payment of accounts, &c., than in the showroom at the head office or works, where there are separate departments to deal with each. It is most essential, of course, not only to be in direct communication with the chief office, but to be able to get through without delay to the various departments. Nothing is more annoying than to be kept waiting while inquiries are being made. It is always more satisfactory to the consumers if the matter is settled without reference to the chief office—for someone else's attention. Of course, such matters as disputed accounts and quotations, &c., are beyond the duties of the showroom, and must be referred to the district inspector. The work is facilitated when the showroom and depôt are together, and can work in conjunction. Queries can be settled, appointments made, and estimates given immediately, when the foreman and district staff are at hand. This saves postal delays.

The showroom should carry a sufficient stock of gas-fittings, burners, globes, rings, and sundries ready for immediate delivery, while the larger appliances, such as stoves, geysers, boilers, &c., should be supplied from the chief depôt or issue department, where a large reserve stock should be ready for dispatch at short notice. The attendant should see that he does not take an order for anything unless it is in stock or delivery can be promised within a reasonable time. In cases where special appliances have to be ordered from the makers, the customer should be told that no definite promise can be given for delivery. This avoids unnecessary future calls or correspondence on the matter. Daily co-ordination between the chief stores or issue department and the showrooms, *re* appliances on hire, is absolutely necessary for successful business.

The Showroom as an Advertising Medium.

A showroom should be the chief advertising medium. The goods should be arranged artistically, and not crowded or lined-up like a section of recruits. Appliances should be in working condition and complete. Nothing is more detrimental to a sale than to find that a burner lights-back or that a part has been borrowed. The window should be changed every week, and the same articles should not appear on two successive weeks. One or two specialities are better than an assortment. The hotplates and grillers must not be covered with tin kettles and pots—one or two here and there on a stove enliven the apparatus; but if one is put on every burner you are covering-up the apparatus you wish to sell.

The showroom is not like any ordinary store, where a purchaser comes once and is not seen again. The first visit is perhaps the beginning of years of association. The impression made by the company's representative on that occasion is one made for the company. It is surely essential then that the staff should be efficient—not only in manners but also in the knowledge of the great industry of which it is one of the necessary units. The attendant should make practical experiments, and obtain a wider view by becoming a member of some gas association, which enables him to visit other companies' showrooms and works.

In conclusion I would say that after business an hour or two occasionally devoted to any of the subjects appertaining to the industry is not wasted. Remember, "Knowledge is power."

Discussion.

The President (Mr. D. Cleave Cross, Lea Bridge) remarked that at the present time advertisement seemed to be the backbone of business; and one of the best methods of advertising gas was through the showroom. There was, perhaps, a little too much thought given to the manufacture of gas and the technical side of its distribution; but it had often been pointed out that a gas company were judged by those who came in contact with the public, and the better service the distribution employees could give the better it was for the gas company. It had to be realized that the appliances must be sold; they would not sell themselves.

Mr. F. Holland (North Middlesex Gas Company) thought the man in the showroom ought to be in a position to make promises as to when work could be done. The customer looked upon the showroom attendant as being the company. How did the author get his "Vitreosil" globes clean, when once they became brown? Window displays ought to be more "live" shows, with fitted-up rooms, ironing demonstrations, and so on. Kitchens and bathrooms should be arranged in showrooms, with geysers and circulators in action.

Mr. S. T. Phillips (Gas Light and Coke Company) did not see how estimates could be given in the showroom.

Mr. J. G. Clark (Gas Light and Coke Company) wished to emphasize the importance of giving the showroom superintendents full technical information. Gas companies must possess an immense amount of information which was not always in the hands of the showroom people, and there was room for a good deal of improvement in this

direction. They must know the efficiencies and suitability of appliances under certain conditions, so as to be sure that any particular apparatus was going to give satisfaction. Showrooms should be well carried out. As a man was known by the company he kept, so probably a gas undertaking was known by the showrooms it had. A point that had been raised reminded him that in one large showroom he had seen some very valuable silk shades exhibited under glass cases, so arranged that the shades could be perfectly inspected all round without being taken out. In this way there was no chance of their being spoiled by dust. This struck him as a very excellent plan to follow. It happened to be in a part of the country where these silk shades were very popular. In some districts, of course, there was no sale for expensive things of this kind. The showroom attendant must keep in mind the class of people likely to visit the place. What might do for one part of a town would not be suitable for another.

Mr. D. J. Winslow (Lea Bridge) regarded the showroom attendant as a very important man, who should combine the necessary business qualities with a certain amount of technical ability. It took years for a man to acquire the requisite qualifications to excel in the work. In a way, glass cases for silk shades were all right; but, on the other hand, they rather conveyed the idea that these goods were of a perishable nature. He had noticed a tendency on the part of consumers to select cookers of a smaller oven capacity than formerly. He wondered whether this was just a cycle, and consumers would revert to the larger ovens when they found some of these small ones insufficient for their purpose.

Mr. H. W. Kerridge (Croydon) would have liked to hear more about their little friend the gas iron. There was a tremendous business to be done in these appliances. It was not enough to put an iron on the shelf in the showroom; its possibilities must be actually demonstrated. There was no need whatever for any place now to have shabby show cards. His company had a machine with which they could prepare their own cards in a very attractive style in a remarkably short space of time. The duties of the showroom staff were extremely onerous. They had to be all things to all customers; and this needed some doing.

Mr. W. L. Westbrook (North Middlesex Gas Company) drew attention to the importance of arranging for the collection of accounts at the showroom, and said that the pay desk should be at the far end, so that every customer had to pass along and see as much of the showroom as possible. Showroom activity and local advertising should be combined. Many of the larger companies possessed demonstration rooms, where lectures could be given; and anything like this, which would bring people along, was to be recommended. "Live" displays were also excellent. An ironing demonstration would prove very effective if a local competition were advertised in connection with it.

Mr. S. C. Waldock (Gas Light and Coke Company) told the meeting that he had wondered on one or two occasions why gas undertakings did not co-operate with the postal authorities and open up post offices. Why should this business be left to the grocer, &c.? It might prove a useful source of revenue to the company, and would get people into the showrooms who might not come otherwise.

The President remarked that the author's showroom appeared to be a model, and one of these days the members would hope to have an opportunity of seeing it.

Mr. Stainer, replying to various points that had been raised, agreed that the showroom attendant was a "buffer" between the consumer and the company. As to the "Vitreosil" ware, so long as it was attended to regularly, a little soap powder should be sufficient to keep it from getting brown.

A Member said that if "Vitreosil" glass did get brown, playing a bunsen flame on it would take the stains away.

Mr. Stainer (continuing) pointed out that the showroom attendant must not only have a knowledge of gas, but he must know something about electricity as well. It was not much advantage to have silk shades under glass cases; a better plan was to have one actually on a gas-fitting. In his opinion, the reasons why people went in for small cookers now were because they wanted something on a stand, and because rents had been increased greatly during the war and people were practically bound to go in for something cheaper. One of the chief points about a showroom was to take gas accounts there. Possibly the post office suggestion might apply in small places; but it would not be a very suitable plan for the larger companies to adopt.

SCOTTISH JUNIOR GAS ASSOCIATION.

(WESTERN DISTRICT.)

Visit to the Port Glasgow Gas-Works.

Last Saturday week, members of the Association paid a visit to the well-equipped gas-works at Port Glasgow, where they were cordially received by members of the Town Council, including Bailie Dick (the Convener of the Gas Committee). Mr. R. W. Cowie, the Manager, was also in attendance.

The Juniors were conducted over the works, and had explained to them all the features of outstanding interest in the recent erection. Before leaving, the visitors were entertained to tea, the chair being occupied by Bailie Dick. He expressed the hope that the visit would prove beneficial and helpful. In the course of a humorous speech Mr. R. W. Cowie narrated a few of his experiences with the older plant at Port Glasgow. There could be no disguising the fact, he said, that things were in a bad state when he took over the works. Happily the new works had been planned on the most modern lines; and his earlier troubles were lost sight of in the pleasure which it gave him to manufacture gas under the present conditions.

The following technical details of the gas-works at Fyfe Park, Port Glasgow, will be read with interest.

Description of Works.

At the time of the outbreak of the war, the Port Glasgow Town Council had under consideration the building of a complete new gas-works. This was necessitated through the obsolete nature and ruinous condition of the then existing works. Owing to the various conditions brought about by war restrictions, little was done by way of improving the old works, and matters gradually became more and more serious, as one accident after another occurred; till in May, 1919, the one and only gasholder burst through sheer weakness. Steps were then taken to expedite the plans for new works.

Messrs. West's Gas Improvement Company, Ltd.. secured the contract for complete carbonizing plant, including retort-bench, coal and coke handling plant, retort-house and coal stores, &c. The coal is received in end-tipping wagons, and emptied by one of two hydraulic tippers into a coal receiving hopper, from which it passes to the coal breaker by a jigging screen. From the breaker it passes through a rotary filler to the gravity conveyor, which elevates the coal to the overhead hoppers capable of containing 48 hours' supply, at maximum demand, or through shoots into the coal store adjacent to the retort-house.

The retort-bench consists of two settings containing twelve retorts 21 ft. long in units of two retorts—one setting having eight retorts and the other four. There are three producers, one for every four retorts. The setting is divided by vertical division walls into a series of heating chambers each supplied by a separate vertical fuel-gas uptake, and each containing two retorts. These heating chambers are again divided by horizontal partitions or floors into combustion chambers separately fed from the uptake flue and individually controlled. This arrangement of heating meets the present-day requirements of perfect control of the application of the heat. The West's system was adopted in Port Glasgow chiefly because of the ease with which the heats can be regulated at any point of the retorts, and the ease with which efficient steaming can be practised.

The condensers are of the water-cooled type, made by Messrs. Henry Balfour & Co., of Leven. They are formed of rectangular cast-iron towers 4 ft. square, 21 ft. high, and each of a normal capacity of 500,000 c.ft. per day. In each tower there are 121 tubes (2 in. diameter) providing 2300 sq.ft. of water-cooled surface. The gas connections are arranged with two four-way valves to enable either condenser to be worked singly, or both together, or reversed at will. The water connections are 3 in. diameter, and arranged with a 3 in. diameter four-way valve to the top and bottom chambers of each tower, and arranged for similarly reversing the flow of water.

The purifiers are four in number, 20 ft. square by 5 ft. deep, also made by Messrs. Henry Balfour & Co. The covers are luteless, and fitted with Messrs. Clapham's patent "eclipse" joint, and fastened with the usual swing bolts. The connections are 15 in. in diameter, and are arranged for the downward flow of the gas through the material. The purifiers are fitted with Weck's patent valves, and are all drained to one common seal-pot.

The gasholder is a spirally-guided one of two lifts in a steel tank, all of which are above the ground. It has a capacity of 500,000 c.ft., and was built by the Barrowfield Iron-Works, of Glasgow.

The sulphate of ammonia plant is capable of making 30 cwt. of salt per day. The saturator was made by Messrs. Alex. Moir & Sons, Glasgow. The still, heater, lime pump, and spent liquor valve are all new and of Wilton's make. The heaters of Pettigrew's make used in the old works are made to do duty as coolers now. The acid is received in tanks, and run by gravity into the 8 ton acid storage tank, from which it flows into the saturator.

The following table is of interest, and shows a striking contrast between the efficiency of the modern plant and the wastefulness of the old one.

Comparative Statement of Results.

	New Works. (Vertical Retorts.)	Old Works. (Horizontal Retorts.)
Gas made per ton of coal	19,300 c.ft.	11,000 c.ft.
Calorific value	420 B.Th.U.	..
Therms per ton of coal	81·06	..
Coke made per ton of coal	6 cwt.	7 cwt.
Tar " "	19 galls.	13 galls.
Sulphate " "	40 lbs.	21 lbs.

Net Cost of Gas into Holder.

(Per 1000 c.ft.)

December, 1922	6·54d.	December, 1920	34·60d.
January, 1923	6·27d.	January, 1921	34·00d.
February, 1923	6·84d.	February, 1921	32·11d.
Average for three months	6·55d.		33·57d.

At a meeting of the Royal Society of Arts on Wednesday evening, May 9, Dr. W. A. Bone, F.R.S., will read a paper on "Recent Developments in Surface Combustion."

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Capital of the Birmingham Gas Undertaking.

Sir,—In your issue dated March 21, you publish a report of the proceedings of the Midland District Conference of the British Commercial Gas Association, held at Gloucester. During the course of his address, the Chairman of the conference submitted the statement set out on p. 767 of the "Journal," relating to the capital cost of various undertakings, from figures abstracted from the Board of Trade returns for 1921. May I point out that the figures given in respect of Birmingham are incorrect—our total capital being £3,008,949, as shown in the Board of Trade return, and not £4,670,000, as quoted.

The mistake of adding the capital repaid to the total authorized has evidently arisen owing to the difference in the setting-up of the portion of the return devoted to local authorities, where the amount of "loans repaid" takes the place of "loan capital," which appears in the companies' section of the return. If thetable is corrected, the following would be the Birmingham figures for total capital:

Make of Gas. 1000 C.Ft.	Total Capital.	Per Million C.Ft.	Per 1000 C.Ft.	Yearly Cost at 5 P.Ct.
10,740,100	£ 3,008,949	£ 280	s. d. 5 7	d. 3·35

In my opinion, however, the calculation should be based on the capital outstanding—*i.e.*, total capital expended, less the amount repaid. The figures would then be reduced to:

Make of Gas. 1000 C.Ft.	Total Capital Outstanding.	Per Million C.Ft.	Per 1000 C.Ft.	Yearly Cost at 5 P.Ct.
10,740,100	£ 1,339,185	£ 125	s. d. 2 6	d. 1·5

Our make of gas in the year ended March, 1918, was 12,812,788,000 c.ft.; and my Chairman called attention to this factor during the discussion, as being a point to be taken into account in examining the complete table.

I shall be obliged if you will publish this correction, as the information in its original form is somewhat misleading.

A. W. Smith,
General Manager and Secretary.

Council House, Birmingham,
March 27, 1923.

REGISTER OF PATENTS.

Prepayment Meters.—No. 178,858.

Landis & Gyr A. G., of Zug.

No. 11,305; April 21, 1922. Convention date, April 21, 1921.

This invention relates to prepayment meters (for gas, water, electricity, or other commodity) of the type in which two cyclometer counting trains are mounted freely on a common spindle, one of these counting trains indicating the total number of coins inserted, the other the number of coins still unused. In coin-freed gas-meters it has been suggested previously to connect the measuring shaft of the meter to the differential gear by a pair of interchangeable toothed wheels, one being mounted on the outside of a hinged frame containing the differential gear and the other outside the frame containing the meter mechanism.

According to this invention, the first counting train is driven by a spindle carrying the loosely mounted transfer wheels for the counting train. The second counting train is driven by a spindle carrying the differential gear. The motion of the measuring element is transmitted to the differential gear by variable change-wheels, all of which are mounted on the outside of one and the same frame.

Coke Cooling.—No. 192,182.

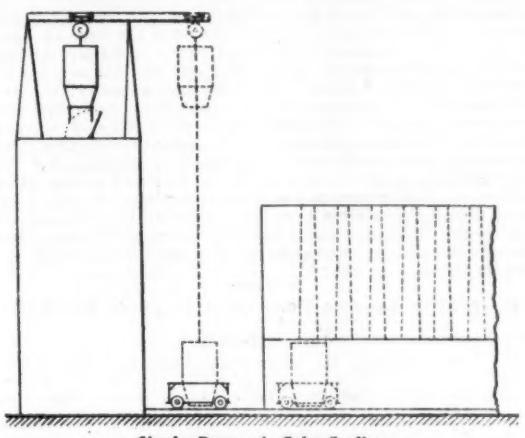
Kilburn, B. E. D., of High Holborn.

(A communication from Sulzer Frères Société Anonyme, of Winterhur.)

No. 29,103; Nov. 2, 1921.

This invention relates to the dry cooling of incandescent coke and like distillation products in plant having a plurality of distillation chambers. In previous plant of this type each distillation chamber has had its own cooling reservoir, and these cooling reservoirs have been of such a size that they can accommodate a charge from one distillation chamber only. Thus the heat supply to the heat-utilizing device is often too great or too small, and they do not allow the quantity of cooled coke delivered and the time of delivery to be adjusted to suit variable requirements.

The present invention has for its object to provide a method of cooling which is not subject to the disadvantages of previous plans; and to this end the coke from a number of distillation chambers is discharged into a single cooling reservoir in which it is cooled by a stream of gas, the speed of which can be varied and which passes over a heat-exchanging device, the cooling reservoir being of such a size that it serves also as a store in which the output of heat and the delivery of coke or the like are balanced against the supply.



Single-Reservoir Coke Cooling.

A method of carrying out the invention is illustrated by way of example in the accompanying drawing, which shows a device for cooling coke, with the distillation furnace in elevation. After the distillation process has been completed, the retorts are discharged singly or in groups into a container, which is then brought to the cooling reservoir in the manner shown, whereupon the process begins afresh and can be repeated as often as necessary. The removal of the heat and the transference thereof to the utilizer is effected by means of the air contained in the cooling reservoir and the passages of the steam generator or other heat utilizer, this air being maintained in circulation therein by a blower in such a manner that it passes upwards through the coke to the steam generator. The cooled products, which form the lower layers of the contents of the reservoir, are successively removed through a discharge opening (not shown) disposed in the bottom of reservoir. The cooling reservoir is disposed at a height above the coke oven rail track, and is made of such a size that it serves as a store in which the coke supply is balanced against a reasonable removal of the cooled coke. The size of the cooling reservoir also makes it possible for the amount of heat transferred to the steam generator to be varied when necessary, in accordance with the steam consumption. This may conveniently be effected by controlling the speed of circulation of the air. The output of heat and the delivery of coke may thus be determined in accordance with fluctuating requirements, and are within certain limits independent of the supply.

Conveyors or Elevators.—No. 192,287.

Guest, A. E., of Sutton Coldfield, Abbott, A. P., and Johns, W. H., of Swansea.

No. 3316; Feb. 4, 1922.

This invention relates to conveyors or elevators of the kind which include a frame fitted with rotary members which drive a travelling band, the material either travelling direct upon the band, or in some cases the band itself may carry receptacles for receiving the material. In constructing such conveyors it has already been proposed to make a complete conveyor in a number of sections which are angularly adjustable with respect to each other; the drive for the rotary members in different sections being conveyed from one section to another by chain or other gearing.

According to the present invention, the ends of the sections are provided with laterally projecting bearings or bosses, the inner surfaces of which form bearings for the transverse driving shafts; while upon the outer surfaces of the bosses connecting links are placed which are long enough to allow the sections to be adjusted at will in overlapping relationship with one section above the other.

Some of the sections may be arranged transversely with regard to other sections, and may be connected with same so that the drive of the rotary members in one section is transmitted to the drive of the rotary members in the other section.

The various sections are connected together so that they can be adjusted angularly with respect to each other without in any way interfering with or interrupting the driving mechanism which transmits the drive from the rotary members of one section to the rotary members of another section or to an intermediate positively-driven rotary member.

With such an arrangement the primary drive may be applied at any point, and the whole system may automatically be driven. Any section, however, can be placed out of gear by the provision of friction or other clutches upon the driving shafts of the rotary members.

Treatment of Coal.—No. 192,816.

Dvorkovitz, P., of Holland Park.

No. 30,722; Nov. 17, 1921.

This invention relates to the known process of treating coal or other carbonaceous matter for obtaining liquid distillate products therefrom, in which process the coal is heated in a closed retort by contact with hot gas and afterwards the vapours obtained are condensed; the operation being conducted in apparatus comprising means for heating the gas to be supplied to the interior of the retort and a condenser in which the volatile products passed from the retort are condensed, and obtained in the liquid form.

The invention has for its special object to treat the carbonaceous matter in an improved way, so that oils of the paraffin series, as distinguished from hydrocarbons of the aromatic series, are obtained therefrom in an efficient and economical manner. Accordingly the preheated gases are admitted only to the upper end of the retorts from

a preheater which is separate from the retorts; the gases being hydrogen, water gas, producer gas, or ordinary coal gas, the temperature of which is controlled so that the heat produced in the retorts is such as will liberate from the charge in the retorts only, or mainly, the desired oils of the paraffin series. The heat required for this purpose is not higher than about 500° C. and not lower than about 280° C. It has been found that the temperature of the charges in the retorts should not exceed about 500° C.; the lower temperature being, of course, only such as will distil-off such amount of the oils of the paraffin series as will make the process sufficiently profitable—for instance, 280° C.

The regulation of the temperature of gas admitted to the retorts is therefore of great importance, and the temperature is very conveniently obtained by providing a preheater separate from the retorts, in which the gas can be preheated to the extent required to produce in the retorts the aforesaid temperatures; but no claim is made to the preheater *per se*.

Fastening Inverted Mantles to their Holders. No. 193,259.

Hiller, Dr. F., of Charlottenburg.

No. 3578; Feb. 7, 1922.

This invention relates to a method for fastening inverted incandescent mantles to their supporting holders by employing alkali phosphates, easily fusible in their own water of crystallization, for the production of the vitrifiable glaze.

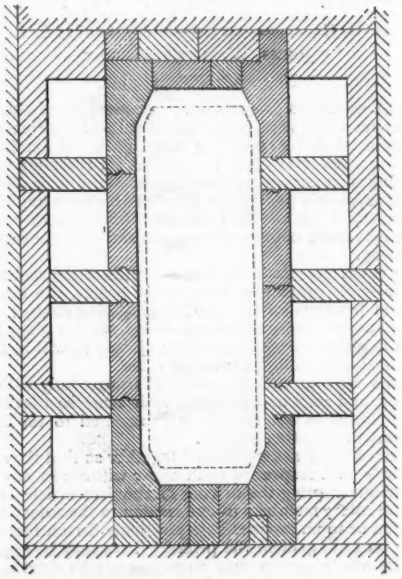
Prior to mounting the mantle, the groove of the holder is coated with small amounts of alkali phosphates, which, during the burning-off of the mantle, form on the holder a glazed melt which effects the connection between the holder and the mantle. If desired, the impregnated fabric of the mantle can be attached beforehand to the holder by means of a thread. This thread need only hold until the burning-off of the mantle and formation of the glaze have been simultaneously effected; the glaze and not the thread forming the real means of securing the mantle. Consequently, instead of the asbestos thread usually employed, an ordinary combustible textile or paper thread can be used for this provisional fastening.

Vertical Gas-Retort Construction.—No. 193,306.

Brooke, R. M., and Whitworth, W., both of Halifax.

No. 8531; March 24, 1922.

The objects of this invention are: To manufacture and build up double-tapered vertical retorts with angular corners which will retain the advantages of the round-cornered retorts; to reduce to a minimum the number of special moulds and blocks for forming the retort corners; to reduce the amount of cutting of ordinary bricks in the building of the retorts; to retain the thinnest possible joints; and to increase the strength of the retorts at the corners and corner-block forming the same.



Brooke and Whitworth's Retort Corner-Block.

The drawing shows a horizontal cross-section of a double-tapered vertical retort with the adjoining flues. It will be seen that in place of the curved concave surface of constant radius of the well-known corner-block, the latter is formed with a plane surface at this part, running at an angle to the corresponding side and end walls of the retort much greater than the right angle of square-cornered retorts. The leg of this corner-block forming part of the side of the retort is kept a constant length, and the angle of the corner filling is kept constant so long as the taper of the retort is kept constant, although the side and end taper may vary. The only variation required to be made to suit the varying taper in both directions of the retort, is a slight reduction in the width of the corner-block either by cutting it or by inserting a packing piece into the mould for this purpose when moulding the block.

The drawing shows a retort with twice as much taper at the ends as at the side; and the correct plane surfaces of the corner filling must have sides forming a right angle, in the proportion of two to one, as indicated, so that if 1 in. is cut off the width, that face of the block is increased in length by 2 in., which gives the required taper when this block of reduced dimensions is fitted against the filling bricks. The ordinary brick filling at the narrow ends of the retorts is kept, by this construction of corner brick, a constant width, which is a multiple of ordinary standard dimensions, and dispenses with the cutting thereof or the making of thick joints in order to obtain the required taper of the retorts in the width.

Gas Cooking-Stoves.—No. 193,265.

Waite, G., of Bexhill-on-Sea, and Gassaver Cooker Co., Ltd., of Old Broad Street, E.C. 2.

No. 3834; Feb. 9, 1922.

(Patent of addition to No. 155,879 of Aug. 30, 1919.)

This invention relates to domestic and commercial heaters, and is a modification of the invention described in patent No. 155,879. The heater described in the above-mentioned patent comprises a cone or dome of metal or other suitable material adapted to be placed over a gas-ring to collect the heat therefrom; this dome being formed with one or more flues to convey the heat to a plate.

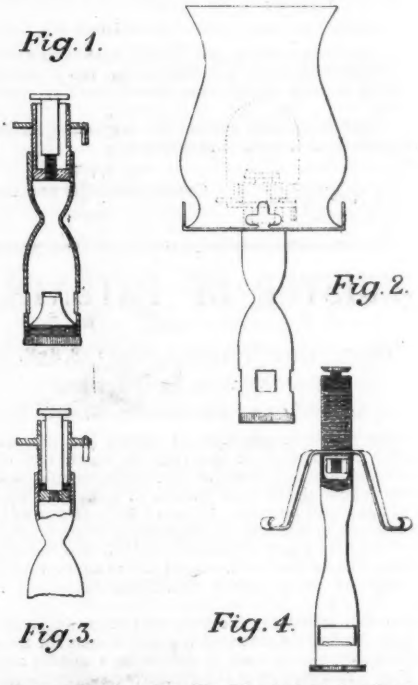
According to the invention, independent use can be made of the gas-ring by providing the stove with an extension, directly underneath which the gas-ring can be slid and on which a cooking utensil can be placed so that the flames can impinge upon the utensil.

Incandescent Gas-Burners.—No. 193,471.

Rogers, R. J., of Birmingham, and the Bland Light Syndicate, Ltd., of Little Trinity Lane, E.C. 4.

No. 31,063; Nov. 21, 1921.

This invention relates to incandescent gas-burners of the type wherein a nozzle adapted to support a mantle co-operates with a spreader of which the position is adapted to be varied so as to regulate the passage of gas and air through the space between the outlet from the nozzle and the spreader.



Burner Construction—The Bland Light Syndicate.

According to the present invention, the burner nozzle is externally screw-threaded and engages with the internally threaded end of the mixing tube of the burner; while the spreader, which co-operates with the burner nozzle, is adapted to be turned on a screw provided on a bridge-piece in the burner nozzle or in a perforated plug in the mixing tube, or the stem of the spreader is screw-threaded and passes through a perforated frame in the burner nozzle. The burner nozzle is preferably fitted into a mixing tube having a constricted bore.

Examples of the invention are clearly shown in the accompanying drawings, of which fig. 1 is a view in section of one form; fig. 2 is an exterior view of the same form with a globe gallery added and with an inverted "inverted" gas-mantle in position; fig. 3 shows a burner much like that seen in fig. 1, but of modified form; and fig. 4 shows a slightly modified construction, the burner nozzle and the mixing tube being shown partly broken away below the globe or shade carrier, in order to show the frame for receiving the screw-threaded stem of the spreader.

Eliminating Effects of Vibration on Mantles. No. 193,459.

Clegg, N., of Liverpool, and Tillston, J. F., of Neston.

No. 28,719; July 6, 1922.

This invention relates to an improved device for eliminating the effects of shock or vibration on mantles of gas-burners, of the type

in which a tube of flexible material (such as rubber) is arranged coaxially within an enclosing spring or elastic helix carried between a pair of abutment flanges on end connections for the flexible tubing.

It has already been known to provide, in anti-vibration devices of this type, grooves in the form of a screw-thread on the end connections for holding the ends of a helical spring. According to the simplified construction of this invention, each end connection has a smooth tubular portion for receiving the rubber tube end as hitherto, and one of the end connections is provided with an annular groove for locking the end convolution of the spring.

Fixation of Nitrogen.—No. 194,026.

WOODALL, DUCKHAM, AND JONES (1920), LTD., of Grosvenor Gardens, S.W. 1; OLDBURY S.C. SYNDICATE, LTD., of Queen Victoria Street, E.C 4; and DUCKHAM, Sir A. M'D., of Grosvenor Gardens, S.W. 1.

No. 34,280; Dec. 20, 1921.

This invention relates to a process for the fixation of nitrogen by means of a heated mixture of barium carbonate or oxide, with carbon. The processes hitherto proposed for this purpose which have been conducted in an externally heated retort, have not, say the patentees, been successful commercially; and this lack of success when working with a vertical retort is partly due to the facts that the heated material attacks the highly heated walls of the retort or the like in which it is heated, and that the material is apt to cake and attach itself to the walls of the retort and so in time to prevent the passage of the material through the retort. The working with a horizontal retort has been unsuccessful because of the difficulties attendant on the withdrawal of the material in a highly heated state.

According to this invention, the portions of the retort, muffle, or oven with which the material comes into contact are not directly heated, and preferably the material is so arranged that it protects from the heat the portions of the retort with which it is in contact. This result is most easily attained by spreading the material in a thin layer on the bottom of a muffle furnace and applying heat only to the roof of the furnace.

In order that the process may be continuous, it is preferred to form the bottom of the muffle as a conveyor, so that the material on the conveyor nowhere touches the walls of the muffle and is gradually heated and then cooled in its passage.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for March 28.]

Nos. 7776 to 8465.

AIRD, K.—"Doors for stoves." No. 8309.
AIRD, K.—"Grilling burners of gas-stoves." No. 8310.
ALDRIDGE AND RANKEN, LTD.—"Apparatus for manufacture of coal gas." No. 7865.
ASHLEY, T. J.—See Aldridge and Ranken, Ltd. No. 7865.
BJÖRNSTAD, J.—"Apparatus for indicating flow of liquid through pipe." No. 8328.
BURGOYNE, J. S., AND BURNERS (1921), LTD.—"Gas-regulators for incandescent burners." No. 8363.
DALE, A. G. & G.—"Gas sampling and/or analyzing apparatus." No. 8148.
DEMPSTER & SONS, LTD., R.—"Gravity-bucket conveyors." No. 8167.
DUFFIELD, F. L.—"Producing gas." No. 7836.
FIGG, T.—"Atmospheric gas-burners." No. 8171.
GIBB, D. M.—"Taps or cocks." No. 8232.
GLOVER, W. R., and T. GLOVER & CO., LTD.,—"Coin-freed gas-meters." No. 8187.
HATHWAY, A. W.—"Gas-meter fittings." No. 7901.
HILEY, G. J. O.—See Hathway, A. W.—No. 7901.
HUTTON, J.—"Gas-turbines." No. 8377.
JOHNSTON, A. G. KENT.—"Means for lighting and extinguishing gas-lamps from a distance." No. 7896.
KRAFFT, M.—"Purification of gases." No. 7814.
LAING, B.—"Gas manufacture." No. 8107.
LANEGAN, W J.—"Hopper doors for coal wagons, &c." No. 8420.
MALONE, J. F. J.—"Internal-combustion gas-engine." No. 8033.
MITCHELL, G. P.—"Screening apparatus for coal, coke, &c." No. 8095.
MURDOCH, J. H. BURN.—"Controlling devices for flow of liquids." No. 8189.
NIELSEN, H.—See Laing, B. No. 8107.
PARKINSON STOVE CO., LTD.—See Gibb, D. M. No. 8232.
PULSOMETER ENGINEERING COMPANY, LTD.—See Björnstad, J. No. 8328.
SCHMALTZ, W.—"Process of preventing spontaneous combustion of coals." No. 8013.
SOUTH METROPOLITAN GAS COMPANY.—"Fire-grates." No. 7878.
SPRAGUE, H. H.—"Gas-meters." No. 8236.
STEWART, J. G.—"Means for automatically obtaining a gas of constant calorific value." No. 7919.
THOMPSON, J.—"Repairing inner linings of gas-retorts." No. 8391.
TOOGOOD, H. J.—See Dempster and Sons, Ltd., R. No. 8167.

William Everard Davies & Co., Ltd.—A private company has been registered under this title, with a capital of £10,000, in 4000 shares of £1 and 120,000 shares of 1s., to carry on business as consulting chemists, &c. The office is at Wellington House, Buckingham Gate, London, S.W.

Liverpool Gas Price Reduced.—Notice is given by the Liverpool Gas Company that, after the March quarter meter readings, the price of gas will be reduced to 8·4d. per therm (3s. 3·9d. per 1000 c.ft.) to consumers through ordinary meters. The charge to prepayment consumers will be 9·9d. per therm. For large users, there will be discounts allowed ranging from 2½ to 10 p.ct., according to consumption.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Macclesfield Corporation Bill: Reported that the Standing Orders have not been complied with in respect of the petition for additional provision in the Bill.

Smethwick Corporation (Gas) Bill: Read a second time.

A Select Committee, consisting of Lord Walsingham, Lord Hindlip, Lord Loch, Lord Cunliffe, and Lord Muir Mackenzie (Chairman), have been appointed to consider the South Elmsall and District Gas Bill and the Swanage Gas and Electricity Bill; to meet on Wednesday, April 25, at eleven o'clock.

Gas Regulation Act.

On Tuesday of last week, the Earl of Clarendon moved that the draft Special Order proposed to be made by the Board of Trade under section 10 of the Act, on the application of the British Gas Light Company, with respect to the Norwich undertaking, be approved. The motion was agreed to.

HOUSE OF COMMONS.

Progress of Bills.

South Oxfordshire Water and Gas Bill: Standing Orders not previously inquired into complied with; to be read a second time.

The Hoylake and West Kirby Gas and Water Bill, being unopposed, has been removed from Group A, and referred to the Committee on Unopposed Bills.

Coke and Pitch Exports.

Mr. CAPE asked the Secretary for Mines if he was aware that shipments abroad of coke and pitch have taken place from Cumberland ports; if so, what quantity of each had been sent abroad; what were the prices per ton realized; and what were the prices per ton for the same products when sold to the consumers in this country?

Sir P. LLOYD-GREAME replied that exports of coke and pitch from Cumberland ports registered during the two months January and February amounted to 1876 tons of coke and 1551 tons of pitch. He was unable to give the other items of information referred to in the question.

Gas Prices (Mitcham).

Mr. EDE asked the President of the Board of Trade whether he had received a request from the Mitcham Urban District Council that an inquiry should be held into the standard price of gas in that area; the date such request was received; whether an answer had been sent, and, if so, when; and, if a reply had not been sent, when one would be?

Sir P. LLOYD GREAME said that the request was received on Jan. 25. It had been found necessary to frame rules governing the procedure in regard to applications of this nature under the Gas Regulation Act, 1920. These rules would be ready almost immediately; and as soon as they were ready the Council would be given the opportunity of proceeding with their application.

Coal Supplies to Public Utility Undertakings.

Mr. LANSBURY asked the Secretary for Mines whether he had received a resolution from the Poplar Borough Council complaining of the difficulty experienced in securing coal supplies at a reasonable price and at the time required; and would he consider legislation for the control of the coal industry?

Lieut-Colonel LANE-FOX stated that he had received the complaints referred to; and he had no doubt that public utility undertakings and manufacturers who did not contract well ahead when the price of coal was low were now obliged to pay an increased price. He certainly could not subscribe to the suggestion that the situation was such as to warrant asking Parliament to reimpose control over the coal industry.

Romsey Gas and Coke Company, Ltd.

On Tuesday, March 27, a petition presented by the Company, asking the Court to confirm resolutions altering their objects, came before Mr. Justice Astbury. Mr. Turner said the Company desired to qualify themselves to apply to the Electricity Commissioners for liberty to supply electricity to Romsey and the immediate neighbourhood. It was necessary to obtain power to do this, in order that the Company might obtain a Special Order from the Commissioners. His Lordship sanctioned the alteration.

Barnard Castle Gas Company.—The annual meeting of the Company was held on March 26, Mr. R. T. Richardson presiding. The Directors reported a gross profit of £1263, out of which, after paying debenture and bank interest, there remained a net profit of £729, which would be applied to the reduction of the debit balance of last year on the profit and loss account to £789. This debit it was hoped to clear off during the current year, in which event the Company would be able to return to normal conditions. The adverse debt was created when in post-war years the cost of manufacturing gas rose to 4s. 10d. per 1000 c.ft., and the price chargeable by the Company was by their Act of Parliament restricted to 3s. 6d. The restriction was relaxed by the Gas Regulation Act of 1920, when the charge was increased to 7s. 9d. per 1000 c.ft. It was proposed to reduce the price to consumers by 6d. per 1000 c.ft. The Chairman expressed the belief that things had taken a turn for the better. The question of providing electricity had been considered by the Directors; but inasmuch as the estimated cost of the plant was £12,000, there was a doubt of the additional capital being raised, and the matter had been deferred. Mr. H. C. Watson seconded the adoption of the report, which was agreed to.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" with regard to applications to the Board of Trade for Orders under the Gas Regulation Act.

DECLARATIONS OF CALORIFIC POWER.

Tuxford and District Gas Light and Coke Company.—500 B.Th.U. (June 24.)

Westgate and Birchington Gas and Electricity Company.—500 B.Th.U. (June 28.)

GAS REGULATION ACT ORDERS.

The Director of Gas Administration has forwarded a copy of the following further Order made by the Board of Trade under section 1 of the Gas Regulation Act:

Tipton Urban District Council.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 13·6d. per therm. (March 22.)

BIRMINGHAM GAS CHARGES AGAIN REDUCED.

At a Meeting of the Birmingham Gas Committee on Monday of last week—Alderman J. H. Lloyd presiding—it was decided to reduce the price of gas by 3d., making it 3s. 7d. per 1000 c.ft., for the quarter ending June. The new schedule will be as follows:

For Lighting, Cooking, and Domestic Purposes in One Premises.

	Per 1000 C.Ft. From s. d.		To s. d.
Up to and including 100,000 c.ft. per quarter . . .	3 10	..	3 7
Quantity in excess of 100,000 ,, up to 500,000 per qr.	3 9	..	3 6
,, ,, 500,000 ,, ,, 1,000,000 ,,	3 7	..	3 5
,, ,, 1,000,000 ,, ,, 2,000,000 ,,	3 6	..	3 3
,, ,, 2,000,000 ,, ,, 3,000,000 ,,	3 4	..	3 1
,, ,, 3,000,000 ,, ,, 4,000,000 ,,	3 1	..	2 10
,, ,, 4,000,000 ,, per quarter . . .	2 10	..	2 7

For Manufacturing and Motive Power in One Premises.

Up to and including 1,000,000 c.ft. per quarter . . .	3 4	..	3 1
Quantity in excess of 1,000,000 ,, up to 2,000,000 per qr.	3 1	..	2 10
,, ,, 2,000,000 ,, ,, 3,000,000 ,,	2 10	..	2 7
,, ,, 3,000,000 ,, ,, 4,000,600 ,,	2 7	..	2 6
,, ,, 4,000,000 ,, per quarter . . .	2 4	..	(No reduction)

The above prices are subject to 5 p.ct. discount for prompt payment.

Gas supplied through automatic meters to be increased as under:

	Installations in Use Less than Ten Years. C.Ft. per Penny. From	To		Installations in Use Ten Years and Upwards. C.Ft. per Penny. From	To
With meter only	21½	23	..	21½	23
With meter and Corporation fittings	20½	22	..	21½	23
,, ,, ,, ,, cooker	19½	21	..	20½	22
,, ,, ,, ,, ,, and fittings	18½	20	..	20½	22

Before the war, the charge for gas for domestic consumption in Birmingham was 1s. 11d. per 1000 c.ft. Then it went up by a series of increases until, at the period of the miners' strike, it had reached 5s. 6d. In January last year, there was a reduction of 6d., making the figure 5s. Then in March, 1922, it was brought down to 4s. 6d., and in September to 3s. 10d.

Repton Gas Undertaking.

At a recent meeting of the Burton-on-Trent Town Council, Councillor Yeomans (Chairman of the Gas Committee) moved that an application should be made to the Board of Trade "for a Special Order under the Gas Regulation Act, 1920, to authorize the Corporation to acquire the undertaking of the Repton Gas Light and Coke Company, Ltd., to extend the limits of the Corporation for the supply of gas so as to include the parish of Repton and so much of the parish of Newton Solney as is not now within these limits, and to confer further powers upon the Corporation in relation to their gas undertaking; that the draft Special Order submitted at this meeting be approved, subject to such alterations as the Board of Trade may make therein and as may be approved by the Gas Committee, and that the Gas Committee and the Town Clerk be instructed to take all necessary steps to carry this resolution into effect." Mr. Yeomans stated that the probable price of the Repton gas concern would be £3500; and the clauses proposed to be incorporated in the Order would enable the Corporation to charge consumers, within the parts of the existing limits which are outside the Borough, but within one mile therefrom, in respect of gas a price exceeding by 10d. per 1000 c.ft., that charged to consumers within the Borough; a differential charge of 1s. in the case of Newton Solney, and 2s. in the case of Repton per 1000 c.ft.; and a minimum sum not exceeding 25s. per quarter for gas where a person has a supply for stand-by purposes only. There was nothing at all unreasonable, he pointed out, in the Order for which they proposed to make application. The resolution was agreed to.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

Half-Yearly Meeting.

The Ordinary Half-Yearly Meeting of the Company was held in the Office, D'Olier Street, Dublin, on Wednesday last—Mr. JOHN MURPHY (the Chairman) presiding.

The CHAIRMAN, in moving the adoption of the report and statement of accounts, said that, when he had the privilege of addressing them a year ago, he felt sufficiently optimistic to state that, in his judgment, the Company had turned the corner, and that, in the absence of any unforeseen circumstances, they might fairly look forward to a prosperous future. Though he had no desire to suggest, by any means, that the millennium had arrived, he still thought that optimism was justified, because, notwithstanding a decrease of 9 p.ct. in the sales of gas, and no relief from the abnormally high wages, the results of the half-year's working were satisfactory. The falling-off in the output was the inevitable consequence of the disturbances which occurred in Dublin at the latter end of June and during July, when trade and business remained at a standstill for some weeks, and several important consumers' premises were destroyed, with the result that they had since ceased to carry on business or to consume gas. It must also be borne in mind that the corresponding half-year with which the comparison was made was likewise to some extent abnormal—by reason of the fact that additional consumption might fairly be assumed to have taken place owing to the scarcity of coal during the miners' strike. In order that consumers and stockholders might derive all the benefit which lay in the Directors' power to grant them, they had announced, as from the reading of the consumers' meters for the March quarter, a further reduction of 2d. per therm (or 9d. per 1000 c.ft.) in the price of gas, which had now been reduced by 25 p.ct. since December, 1921. They were not without hope that still further reductions might be possible, and certainly no effort would be spared in this direction; but, as a preliminary, it would be necessary to secure concessions in the rates of wages at present being paid, which had reached a wholly uneconomic level, and compared most unfavourably with those in operation in Great Britain and Northern Ireland. Turning to the accounts, it would be observed that the capital expenditure had only amounted to £3477, while the sales, depreciation, and credits totalled £5098; so that once again they had found it possible to reduce the total expenditure by £1621, which was a step in the right direction. On revenue account, it was gratifying to find that the cost of their principal commodities—coal and oil—had fallen by the substantial sum of £47,728. The greater part of this saving, however, had had to be conceded for residual products, which had only produced £54,229 as against £83,653, or a falling-off of £29,424. Since the close of the half-year, he regretted to say that prices of gas coals had hardened considerably, and they were now compelled to pay enhanced prices. To sum up, their expenditure for the half-year was down to the extent of £97,000, while income was less by £78,000, and thus they were enabled to carry to net revenue account a profit larger by the sum of £19,000. This latter account showed that bank interest, instead of being a charge, now became a credit; and this meant a saving of almost £1100. The balance of net profit available would allow them to pay the maximum statutory dividend of £5 12s. 6d. p.ct. per annum; but the Directors could not recommend on this occasion a larger dividend than 5 p.ct.—for one reason, among others, that the reserve fund required strengthening, and this could only be done out of divisible profits. They had therefore made an appropriation of £4849 11s. 9d. to the reserve fund, and the balance of £11,172 4s. 2d. remained to be carried forward to the next account. The balance-sheet disclosed a very satisfactory state of affairs. The funds had increased from £82,000 to £101,000, while the liabilities to tradesmen, consumers, &c., had fallen by no less than £57,000. On the other side, there was a substantial increase in the cash at bank of £25,000, and, in addition to this, a sum of £20,000 had been invested on special purposes fund account. Stocks showed a welcome reduction of fully £19,000; and the steamers were also brought in now at a reasonable valuation. The accounts due to the Company had been reduced to the extent of £13,000, and the balance overexpended on capital account by the sum of £4000. It only remained for him to say that there appeared to be every reason, with a return to normal conditions, for confidence in the Company's prospects.

Mr. AUGUSTINE BOND seconded the resolution.

Mr. MAGUIRE thought the dividend rather small, and urged that there should be a reduction in wages in Dublin, as there had been in other places, now that the cost of living had come down. In his opinion, stockholders should be able to look forward to the maximum dividend twelve months hence. He expressed satisfaction with the decrease in the price of gas, and with the increased revenue. Speaking generally, he believed the statement of accounts was satisfactory.

The SECRETARY (Mr. W. J. Grey), in reply to Mr. W. E. Norman, said there had been practically no reduction in wages for over twelve months.

The motion was unanimously passed.

On the proposition of the CHAIRMAN, seconded by Mr. DICKENS, a dividend of 5 p.ct. per annum, less income-tax, on the consolidated ordinary stock was declared.

Wasting Gas at Ellesmere.—Large quantities of gas have been lost by leakage from the gasholder at the Ellesmere Urban District Council's works. When Mr. C. Kesterton, at a meeting of the Council, moved for a Provisional Order for the erection of a new holder, it was stated that last year a motion was passed to engage an expert to give advice on the matter next summer. Mr. Kesterton said people on the canal towing-path could hear the gas hissing from a hole in the gasholder, and Mr. Needham said the holder was a mass of perforations temporarily filled with white lead. The Manager said his men examined the holder morning and evening, and frequently in the evening found holes which were not visible in the morning. There was a new leakage nearly every day, and this had been going on for years. Eventually it was decided to hold a special meeting of the Council, to get expert advice at once.

THE AUSTRALIAN GAS LIGHT COMPANY.

The Half-Yearly Meeting of the Company was held on Feb. 8. Mr. George J. Cohen (Chairman) presided.

The Secretary (Mr. C. U. B. Gurnett) submitted the half-yearly report and presented the accounts. The Chairman stated, before moving the adoption of the report, he would like on behalf of his colleagues and himself, to express keen personal regret at the great loss the Company had sustained by the decease of the Hon. P. T. Taylor, M.L.C., which took place on Nov. 17, who had served on the Board of the Company for a period of eighteen years, including six years as Deputy Chairman. Most of them would be aware that the late Mr. Taylor always took a deep interest in the many and varied activities of the Company, and applied himself ungrudgingly to the solution of the many difficulties which the undertaking had had to face from time to time. He would specially mention the unstinted assistance rendered during the gas strike, which materially helped to keep the wheels of the industry going during that disastrous period. The vacancy thus created on the Board had been filled by the appointment of Mr. A. G. Milson.

The gas sold during the past six months amounted to 2,818,499,000 c.ft.—an increase of 3·5 p.ct. over the corresponding period of last year—while the gas consumers now numbered 173,978, showing a net increase of 7147. There were 3739 public lights in use—a decrease of 2050, due to the adoption of electric light by several municipal councils whose contracts with the Company had expired. In this connection, it was interesting to note that, in regard to the Auburn Municipality, where gas for street lighting had been discontinued in 1921, the revenue received by the Company for the previous year had amounted to £700; while for electric light, it appeared from the Press that the Council had been asked to furnish a guarantee of £1000 per annum for three years and £500 per annum for the three subsequent years, over and above the usual charges.

During the period under review, 46 miles of mains and services had been laid, making the total 3786 miles. The number of cookers amounted to 59,684; 1911 having been sold during the period under review, representing an increase of 481 over the first period of the year. The showroom continued to evidence increasing activities, and the lectures and demonstrations were being well attended. In addition to these demonstrations, arrangements had been made during the period for a demonstrator to call, where requested, at consumers' homes, to correct faults and generally guide users as to the most economical and efficient method to be followed with particular stoves.

The net revenue for residuals showed a considerable increase over the figures for the corresponding period; there being a keen demand for all the Company's bye-products. In regard to sulphate of ammonia, they would be pleased to hear that sales for use within the Commonwealth had increased in twelve months approximately 20 p.ct. This very desirable condition arose out of the propaganda movement begun in the middle of 1921. A somewhat similar condition had arisen in regard to the sale of tar, which had also substantially increased. The Company's patented process in connection with the distillation of tar had proved a great success. This special process had already been adopted by several large companies throughout Australasia, with every prospect of further extensions. Inquiries had been received from Java, where there was a great demand for the product.

Reductions in working and material costs had again been reflected in the price of gas, a further reduction of 2d. per 1000 c.ft. coming into operation on Jan. 1. The industrial user had also benefited by the allowance of 6d. per thousand—which, for many years, applied only to gas used for engines and lifts—now extended to gas used for all industrial purposes, provided the consumption reached 50,000 c.ft. per quarter. Steady progress had been made with the extensions to works and distributing plant since their last meeting. The new installation of Glover-West vertical retorts had been completed and put into commission, with good results. Various other parts of the works plant had also been extended; and considerable progress had been made with the construction of a gasholder at Gordon, intended to improve the supply to the northern suburbs. The rapidly increasing growth of the suburbs had necessitated careful consideration of the prospective demand for gas; and, to ensure that the demand would be adequately met, a further programme of extensions had had to be embarked upon at Mortlake, in which the latest improvements in gas-works plant were being incorporated.

The Directors, during the half-year, had further increased the capital of the Company by the creation of 31,262 additional £6 shares, making the number of shares 420,000, which were distributed among 4004 holders. They would, he was sure, be gratified to know that this issue, which had been submitted to auction in terms of the Gas Act, had been disposed of at prices ranging from £6 6s. to £6 10s.

The Directors proposed that a dividend for the half-year be paid at the rate of 4 p.ct. on the old "A" and "B" shares, and in proportion on the new "A" shares.

The report and accounts were unanimously adopted.

Cromer Gas Company.—At the meeting of the Company on April 3, the Chairman submitted a report which stated that the sale of gas was 8·2 p.ct. less than that for the preceding year, but was approximately the same as that for 1920. After providing for interest, income-tax, and all other charges there remained a balance of profit of £1877 available for division. The Directors recommended a dividend for the year ended Dec. 31 last of 4 p.ct. (less income-tax). The dividend and the tax amounted to £1776, leaving a balance of £101 to be carried forward to the credit of the profit and loss account for the current year. Following upon reductions in the price of gas mentioned in the last report, another reduction of ½d. per therm had been made from Dec. 31; and recently the Directors had authorized a further reduction of ½d. per therm to take effect on June 30 next. This will make the price of gas 1s. 5d. per therm. As it had been found that gas of a higher calorific value gave greater satisfaction to the consumers, it had been decided to distribute, from June 30 next, gas of 473 B.Th.U.—an increase of 25 B.Th.U. per c.ft.

BELFAST GAS UNDERTAKING.

Development Powers under the New Bill.

The Belfast Corporation Bill, which recently secured a second reading in the Northern Ireland House of Commons, and was expected to become law before the Easter Recess, deals in a comprehensive way with various civic schemes that are in prospect, and, among others, those relating to the development and extension of the gas undertaking.

It is provided that, subject to the provisions of the Act, the Corporation may enter upon, take, and use for the purposes of their gas undertaking lands described in a schedule. Power is also sought to erect, maintain, alter, improve, and renew gas-works, with all necessary machinery and apparatus, together with power to make and store gas and to work-up and convert the residual products arising directly or indirectly from the manufacture of gas by the Corporation.

By another clause, the agreement, dated Nov. 17, 1922, for the purchase of the land, premises, works, plant, utensils, and stock of the North of Ireland Chemical Company, Ltd., by the Corporation is made binding upon both parties.

Part 7 of the Bill provides for the extension of existing gas limits so as to comprise, in addition to those limits, the parishes of Carnmoney (co. Antrim) and Drumby and Dundonald (co. Down); the provisions of former Acts are extended by this proposed Act with regard to the manufacture and supply of gas by the Corporation within the existing Company's limits to extend and to have effect within the extended limits. Further, it shall be lawful forthe Corporation at any time, and from time to time, to charge for the supply of gas to consumers outside the boundaries of the city rates and charges greater than those charged to consumers within the city, but not exceeding at any time twice the rates or charges for the time being charged by them for the supply of similar quantities of gas under similar conditions within the city.

It is proposed to incorporate in the Act the Gas-Works' Clauses Act, 1847, except the provisions with respect to the amount of profit to be received by the undertakers when the gas-works are carried on for their benefit, and with respect to the yearly receipts and expenditure of the undertaking. Again, it is sought to incorporate the Gas-Works' Clauses Act, 1871, with the exception of section 8.

The estimated amount required for the general purposes of the gas undertaking is £309,000. The amount for expenditure in connection with the undertaking is given in the Bill at £307,000.

The gas department are, of course, extensive importers of coal. It was originally proposed in the Bill to give the Corporation power to buy, sell, import, and deal in coal, wholesale and retail, and to establish, manage, and carry on depôts for storage of coal, the proceeds to go, after working and establishment expenses, in payment of interest for money borrowed for the purposes stated; any deficiency in revenue or receipts to be made good out of the general purposes fund of the Corporation or the general purposes rate. On the second reading of the Bill, Sir Crawford M'Cullagh, on behalf of the Corporation, announced the withdrawal of the proposal, owing to opposition by influential sections of the ratepayers.

HISTORY OF THE GAS INDUSTRY.

The City's Part in its Development.

A lecture on this subject, illustrated by lantern slides, was given by Mr. W. J. Liberty on Tuesday of last week to the Bishopsgate Ward Club, who met at the Great Eastern Hotel. The President of the Club is Mr. Deputy Walter Bull.

Mr. Liberty began by remarking that it was in the Ward of Bishopsgate that the birth of the gas industry (commercially speaking) took place, over a hundred years ago. In 1810, the indefatigable Winsor, after much opposition and many defeats, succeeded in getting an Act of Parliament. In an old volume, published in 1828, by J. Williams, a citizen "of Cornhill by the Exchange," an ardent agitator on gas and water matters, it is stated that the meeting to further the company contemplated by this Act, and raise the necessary capital, was held in the City at the London Tavern, which was situated in Bishopsgate—a tavern noted for the assembling of citizens for debating the problems of the day. Some £20,000 was then placed at the disposal of 24 gentlemen, as a Committee of Trustees, to ascertain the possibility of lighting the streets by gas. Unforeseen difficulties, however, cropped up to oppose the project. Yet, after three years' perseverance, an Act and a Charter were obtained—hence the name "Chartered Company."

Throughout his lecture, Mr. Liberty showed himself fully acquainted with the history of gas lighting; and at its close there was a discussion, which was taken part in by Mr. Stanley Stone, C.C., Mr. J. E. Henwood (Gas Light and Coke Company), and Mr. E. V. Evans (Chief Chemist to the South Metropolitan Gas Company).

Price of Gas at Crediton.—A letter from Crediton ratepayers stating that they consider a substantial reduction should be made in the price of gas has been received by the Crediton Council. Mr. Parry Jones moved that they write to the Gas Company asking for a reduction; but the Chairman (Mr. W. H. Adams) pointed out that the Council were under a special agreement with the Company. The Lighting Committee were asked to collect information and report.

Cheaper Gas at Plymouth.—The Plymouth and Stonehouse Gas Light and Coke Company have decided to make a further reduction in the price of gas from Lady Day. The Company reduced the price at Michaelmas from 9d. to 8d. per therm, and a similar reduction is now being made, the new price of 7d. per therm being equivalent to 2s. 7½d. per 1000 c.ft. The Plymouth Corporation, who supply the Devonport area, recently reduced the price from 3s. 5d. to 2s. 11d. per 1000 c.ft., so that the Company's gas is 3½d. cheaper.

EARLY HISTORY OF THE GAS PROCESS.

A paper on this subject, which was unanimously voted by those who were present to be of a highly interesting and informative character, was presented on a recent Tuesday by Mr. David Brownlie, B.Sc., F.I.C., to the Newcomen Society, whose meeting place is in Prince Henry's Room, Fleet Street, E.C. The Newcomen Society has been formed for the study of the history of engineering and technology.

The author began by remarking that gas is a very great industry, and has a very old history which could conveniently be divided into three stages. His paper dealt only with the period from the commencement to 1850. The references to the early work of Murdoch and Brunton were accompanied by a number of exhibits which were examined with eagerness by the audience. Allusion was made to the campaigns of Winsor, who, Mr. Brownlie remarked, was subsequently lucky enough to engage a man named Samuel Clegg, who had been a mechanic with Boulton and Watt, and worked as assistant to Murdoch in most of his gas experiments at Birmingham. Clegg was able to improve the process considerably; and in 1806 lime was used to purify the gas partially, which was first bubbled through water, as Murdoch had done, and then passed through lime and water. It would appear that this use of lime was first suggested by William Henry, of Manchester, the well-known chemist. Winsor finally got his Heat and Light Company started, the capital of £50,000 being over-subscribed; and he then applied for a charter to the House of Commons. There was violent opposition to this application, particularly by Boulton and Watt, on behalf of Murdoch, as the original inventor, though they themselves had done very little to help the process. The Bill was subsequently thrown out; but another Bill was introduced at the next session, and passed finally into law on June 9, 1810. In 1812 the London and Westminster Chartered Gas Light and Coke Company received a Royal Charter of Incorporation, and subsequently became the present Gas Light and Coke Company. The first Chief Engineer of the Chartered Company was Samuel Clegg, who was a man of very great ability, and can justly be regarded among the pioneers of the gas industry, and second only to Murdoch.

The author went on to say that the early history of the gas industry altogether makes extraordinary reading. The first gas-pipes used were of lead or wood, and cast iron was also suggested, being first tried in 1810. Mostly, however, old gun barrels were employed, screwed into one another; and when in 1825 wrought-iron pipes were introduced by Whitehouse, these were known as "gunbarrels" in memory of their predecessors. By 1816, about 15 miles of main gas-pipes of various sorts and sizes had been laid in London; Clegg's first mains for the Gas Light and Coke Company being only 2 in. in diameter.

About 1820 the price of gas was something like the equivalent of 15s. to 20s. per 1000 c.ft.; and even this was one-third to one-fourth the cost of oil-lamps for an equal light. But by 1829 there were over 200 gas-works in the United Kingdom; and the price of gas in London had been reduced to about 12s. per 1000 c.ft. The industry, however, continued to experience great difficulty in making the process pay, and was always struggling to improve the yield of gas by increasing the temperature of carbonization. By about 1845-50 this temperature was the maximum the cast-iron retorts would stand, about 1400° Fahr. (760° C.), in which circumstances a ton of good Newcastle coal gave about 8000 c.ft. of gas. The melting-point of cast iron is about 2000° Fahr., and the wear and tear on the retorts, even when protected by fireclay shields, was ruinous.

For high-temperature carbonization the cast-iron retort was doomed; and the obvious material was fireclay, as used to-day, which was the original adoption of John Grafton in 1820. Grafton erected his first retorts at the Cambridge Gas-Works in 1824. These new retorts had a number of advantages. In the first place the temperature of carbonization was raised without difficulty to 1750° Fahr., which caused a complete revolution in the gas process. The yield from a ton of Newcastle coal was increased to about 8750 c.ft. of gas; and very soon temperatures of 2000° Fahr. were attained, with a yield of 9500 c.ft., while the composition of the gas was altered considerably, with formation of benzene hydrocarbons due to "cracking" of the paraffins. The life of the retorts was very satisfactory. The introduction of the fireclay retort was a revolution in the gas industry, and inaugurates what may be termed the intermediate stage of gas manufacture, while at the same time the price was being gradually brought down—being, for example, in 1849 an average of 6s. per 1000 c.ft. in London. More experience with fireclay retorts and still higher temperatures enabled the gas yield to be increased to 10,500 c.ft. per ton of Newcastle coal; and by about 1860 a more or less standard gas of 16 c.p. was adopted for London.

When he took out his patent in 1828 for the vertical retort, John Brunton was Chief Gas Engineer at West Bromwich. Apparently he erected his vertical retorts there and ran them for a number of years; but nothing further is known about them except that the early text-books on gas manufacture simply state that the idea was found to be impracticable, without giving any reason. The same idea was tried in 1829 by Barnet. Brunton seems to have invented also a mechanical charging mechanism for horizontal retorts, which certainly worked at West Bromwich for a number of years, until he retired, when it was abandoned. This appliance consisted of a hopper holding 20 to 28 lbs. of coal, and a piston working through a stuffing-box and propelled by a double-threaded screw, which charged the retort once every hour; the time of charging being six seconds. The red-hot coke at the other end of the retort was discharged into water, and Brunton stated that 35 p.ct. more gas was obtained by this process. One of the difficulties, however, seems to have been that the tar was absorbed by the coke, and thereby rendered unsaleable.

With regard to the use of gas, the whole process of manufacture originated entirely to supply it as an illuminating agent in competition with candles and oil; and until quite recent years this was the chief function of gas. But by about 1851 a few gas-cookers were used in hotels and restaurants, following on the great exhibition at Hyde Park in that year, when a number of gas-stoves were exhibited. The development of gas cooking was, however, very slow in the early period of the industry. Gas was first used for fires for the heating of rooms about 1840; and what may be termed the modern gas-fire was patented by Edwards in 1849. The first gas water-heater was that of Robert Hicks, in 1829.

The few extracts here reproduced have been taken from an advance proof of a very much fuller illustrated account of the paper prepared for "The Engineer."

Mr. Brownlie was rewarded for his trouble by an excellent discussion, in which, among a number of others, Mr. W. J. A. Butterfield and Mr. Samuel Glover took part.

BALTIMORE GAS, ELECTRIC LIGHT, AND POWER COMPANY.

We have received from the above Company their "Year Book" for 1922. This is a remarkable publication. Profusely illustrated by excellent black-and-white drawings, it serves as a link between the consumer and the supplier—a contact which cannot be otherwise than beneficial to the public, and which will doubtless amply repay the trouble—and it has been no small task—of production. The reading of such a book makes one wonder whether sufficient enterprise is being shown on this side, whether activity of this type would not inspire the general consumer with that confidence which is so desirable, and at the same time so productive of good business.

The founders of the Company were men endowed with vision and the pioneer spirit. They were idealists, dreamers if you like, but out of their imagination came the Gas Light Company of Baltimore—the first gas company to be granted a franchise in America. The present Company is the direct descendant of that pioneer. Similarly, Baltimore was one of the first cities in America to have an electric company. In 1906, all the electricity and gas companies were consolidated, and the present Company incorporated. By this consolidation and centralization of power supply, the advantages of quantity production by steam power, the most economic and fullest use of hydro-electric power, and the fitting into each other of all the hourly and seasonal diversities of use were secured to the fullest possible extent, with the lower production costs and minimized investment costs which result for the benefit of the entire community of Baltimore. Under its present management, the Company have, during the past twelve years, constantly pursued a vigorous policy of extending the use of their service to every need of the community to which it could be economically applied. The growth which is the direct result of this intensive effort may be summed-up in two statements:

(1) Baltimore's use of electricity grew more in the last six years than it did in the first thirty-six years of the life of the industry.
(2) Baltimore's use of gas grew as much in the last six years as it did in the first 100 years.

The number of gas consumers has increased over 60,000 since 1910. In 1910 the number of gas-meters was 104,888; in 1922 it was 167,818. The growth of the gas output is the result of the ever-increasing use of gas as an economical fuel in homes and factories. The gas sales for 1910 were 3,041,508,600 c.ft.; for 1922 they totalled 9,307,518,500 c.ft. A recent census of the gas companies of America shows that the average output has been doubled in the past ten years. The Baltimore output has about trebled in the past ten years, and practically doubled in the past six years.

The citizens use gas in large quantities; and in anticipation of the needs of the city, new plant has been erected, which has increased the manufacturing capacity to 53 million c.ft. per day. Underlying the city streets are various-size gas-pipes, ranging from 3 in. to 48 in. diameter. The gas-mains have a total mileage of 886, to which may be added 138,069 service-pipes with a length of 876 miles. This gives the gas dstribution system a total of 1762 miles of pipe. During 1922, 26 miles of main were laid, ranging in diameter from 4 in. to 30 in.

The Company have now 10,375 stockholders, of whom nearly 7000 reside in Maryland. In 1907, there were 683 stockholders. When this figure is compared with the present one, the growth of the Company is seen to have been very rapid.

Coleraine Gas-Works.—A Committee of the Coleraine Urban Council have inspected premises adjoining the gas-works, with a view to the extension and development of the latter. A report on the subject was sent to the Council, who have deferred their decision.

Maryborough (Queensland) Gas and Coke Company, Ltd.—The working of the Company for the half-year ended Dec. 31 resulted in a profit (after making provision for bad debts and all other charges, including £450 for depreciation) of £1795. This it was decided should be disposed of in the following manner: Payment of the usual dividend of 6 p.ct. per annum (free of State income-tax), £1237; to reserve fund, £200; and to reserve for renewals, contingencies, and taxation, £358.

A Visit to the Hilsea (Portsmouth) Gas-Works.—About a hundred delegates to the Portsmouth Trade Council and Labour Party accepted an invitation from the Portsea Island Gas Light Company, to visit last Saturday week the works at Hilsea. The party, who assembled at the Trades Hall, were conveyed to Hilsea in vehicles provided by the Company. At the works they were met by Mr. T. H. F. Lapthorn, J.P. (Chairman), and other Directors and members of the staff. The operations in the various departments were explained, and the delegates asked many questions concerning various processes. The Directors afterwards entertained the delegates at tea. There was a little pleasant speechmaking, in which Mr. T. Carmichael (the Engineer) gave a brief outline of the history of the Company. Mr. W. Gillman J.P. (Deputy-Chairman) also spoke. Mr. A. E. Lythgoe (President of the Trades Council) moved a hearty vote of thanks to the Directors and the staff for the reception they had given the visitors, and assured them that the inspection of the works had been a real and most instructive treat. Mr. J. P. D. Lacey (Vice-President) seconded, and the motion was heartily carried.

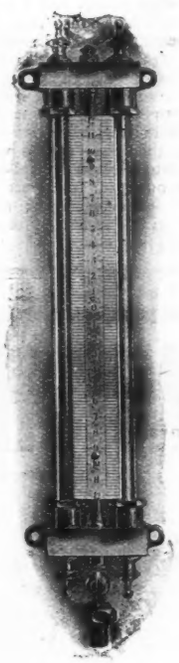
The Victory Prepayment Meter is now advertising itself, so we are bringing to your notice our

GAUGES

All Sizes

For all Purposes.

Enquiries Solicited.



SAWER & PURVES

MILES PLATTING, MANCHESTER. RADFORD ROAD NOTTINGHAM.

45 & 47, Westminster Bridge Road,

LONDON, S.E.

Telephone Nos. { 3289 (City) Manchester. 2025 (Central) Nottingham. 2412 (Hop) London.

Wires { "Sawer Manchester." "Sawer Nottingham." "Metrique Lang London."

AN ENGLISH COMPANY ABROAD IN PEACE AND WAR.

In the March issue of the Bournemouth Gas and Water Company's "Co-Partner" magazine, Sir Charles J. Jessel, Bart., concludes his serial account of the work of the Imperial Continental Gas Association under peace and war conditions. The earlier instalments were noticed in the issues of the "Journal" for Aug. 23, Nov. 8, and Jan. 10.

The only matter of great importance during the year 1915, he says, was the sale of the Association's share-holding in the Frankfort Company. This transaction, in the light of then events, appeared to be a very satisfactory one; but unfortunately such matters were entirely overlooked in the Peace Treaty. The Association had voluntarily sold in marks; and had the proceeds been remitted through a neutral country at the exchange values then ruling, the sale would have proved a good one. But it was necessary to wait until the end of the war to get the money; and the German mark had already begun to slump.

In May, 1915, and in May, 1916, the Association suffered an irreparable loss by the death of the Hon. Sir E. Chandos Leigh on the former date, and of Sir Corbet Woodall on the latter. To the vacancy caused by the death of Sir Chandos Leigh, Major the Rt. Hon. Lord Gorell was elected. Lord Gorell was not destined to serve the Association long; for he was killed on Jan. 16, 1917, when in command of a field battery of Royal Artillery. In view of the provision of the Association's new Act of 1916, the vacancies caused by the lamented deaths of Sir Corbet Woodall and of Lord Gorell were not filled up.

It was not until March 27, 1917, that steps were taken by the German Government to follow the course adopted by the British authorities as regards alien undertakings in this country. The following decree was issued on the date mentioned:

> Liquidation of the English Gas-Works in Greater Berlin belonging to the Imperial Continental Gas Association in London, including the Oberspree Gas-Works, limited liability company, and the gas-works at Grünau, joint stock company.
>
> Inasmuch as the Imperial Chancellor has ordered the liquidation of the Imperial Continental Gas Association by way of sale of undertaking, I beg all interested to send me in their offers for the acquisition of the works by May 15, following.
>
> The conditions of sale, as well as all information regarding the results of the business and the valuation of the plant, can be obtained from us.
>
> A decision with regard to the ultimate price to be accepted is reserved.

When the Association renewed the Hanover contract until 1950, they paid a sum of 10 millions of marks by way of premium for the prolongation; and when war broke out, an agreement was signed that the Town Authorities should carry on the works for the account of the Association during the hostilities. There was a weak clause in this agreement, by which the Municipality were enabled at any time they chose to abrogate it. When Hanover had to be liquidated by Imperial Order, the Association were in the curious position that no outsider could buy the contract from them except by leave of the town; and as it wished to possess the works itself, it was the only bidder for the property and rights under the contract.

The Municipality made an attempt to get them for an old song. They offered 5 millions of marks, not only to cover the whole of the extensive and valuable properties, but also the premium of 10 millions of marks paid for the prolongation until 1950. This offer was declined by the Liquidator; but on the town's offering another million, he accepted, and thus the business in Hanover passed from the Association for the totally inadequate sum of 6 millions of marks (at the Peace Treaty rate of exchange of M. 20.50-75 to the pound, equals £292,500). For some inscrutable reason the Linden establishment, contiguous to Hanover, was not liquidated, and was returned to the Association under the conditions of the Peace Treaty.

To return to Berlin. No private offers were submitted in response to the Liquidator's invitation. Offers were only made by two groups, consisting, as to one, of the City of Berlin in association with certain communes, and of the County Councils of Teltow and Nieder-Barnim as to the other. They made a "knock-out" bid of 58 millions of marks. This was at once declined as totally inadequate, and finally the Government fixed a price for the works and all that appertained to them of M. 85,200,000 (£4,154,500) exclusive of stocks and outlying portions of land not used for the business. At this price, far too low a one, the County Councils of Teltow and Nieder-Barnim became the owners of the valuable undertaking. The Association's people there received many expressions of regret that the long and friendly relations between the Association and Berlin had been so painfully broken.

The concluding paragraphs of Sir Charles Jessel's interesting narrative we reproduce as they appear in the Bournemouth "Co-Partner":

I have previously stated that the capital of the Association was:

Capital stock	£4,940,000
3½ p.ct. debenture stock	£1,154,640
A total of	£6,094,640

Without going into a long story of our lengthy and detailed correspondence with our Foreign Office after the Armistice of Nov. 11, 1918, I may as well come down to the Peace Treaty of Versailles. Most of my readers will know, generally at least, of the effect of this wonderful document, and the difficulties of those who were, and are, claimants under it.

Fortunately for the Association, a Liquidator of its affairs had been appointed who not only knew his work, but also knew how conscientiously to carry it out. His report and the accounts of the charge entrusted to him were a model of what such things should be; and with these in their hands, our Secretary and his staff were able to submit our claims in the clearest possible form. The result was that our claims against Germany in reference to Berlin and Hanover were among the very earliest to be settled.

As I write, we have to-day received in sterling, after deducting the

commission of our Clearing Office, the sum of £5,867,675 13s. 1d.; and we are shortly expecting, in final settlement, a further sum of £1,550,000, making a total of £7,417,675 13s. 1d.—a figure with which you can compare our total nominal capital, and one which I almost pledged myself to the proprietors at the general meeting of May, 1918 (before the war had ended, and before the terms of the Peace Treaty were even drafted), would be the minimum which we should ultimately receive. I do not claim to be a seer, but I do claim to have a very sanguine and optimistic temperament.

On the morning of Nov. 30, 1920, we received, without previous advice, from the Controller of the Clearing Office, a cheque in the Association's favour for £4,740,527 14s. 10d., "on account of your Company's claim for proceeds of liquidation of their property in Germany." The Controller added: "By accepting payment of the within-mentioned sum, your Company will not prejudice their right to claim, under Article 297 (*e*) of the Peace Treaty, compensation for damage to their property."

I had, at a previous meeting, promised our proprietors that, as soon as possible after the receipt of any substantial sum of money from the Clearing Office, I would call them together in order to decide how it should be dealt with. Of course, the Board had prepared a scheme; and on Dec. 21, only three weeks after the money was in our hands, this was submitted to the proprietors at an extraordinary general meeting.

The scheme comprised: (1) An interim dividend of 20 p.ct. (2) A return of capital of 60 p.ct. (3) A repayment of 65 p.ct. of the debenture stock at 105 p.ct. This scheme was accepted by the proprietors, and duly carried out, so that to-day our capital stock has been reduced from £4,940,000 to £1,976,000, and our debenture stock from £1,154,640 to £402,374.

Now my story ends. It is a long history of struggle crowned by great achievement, and a period of prosperity that was only to be closed by the great European war. The men who started this enterprise were stout and venturesome, and how trivial seems my oftentime expressed disgust at the discomforts of a voyage to Berlin or Vienna in sleepers with restaurant cars, when compared with what my predecessors must have undergone in their journeyings by diligence or post-chaise, with the bad roads and bad inns of that time in Germany and Austria! It was scarce ten years after the battle of Waterloo, and it was from a country perhaps more weighed down relatively by debt than we are now, that the capital for this adventure was raised. Difficulties of distance, differences of language, customs, and ideals were overcome by the plucky staff, who have left all over the Continent a tradition of "I.C.G.A." methods and manners which are the proud heritage of their successors even to this day.

I cannot close without putting on record the deep sense of my obligation to Mr. R. W. Wilson (for over fifty years a member of our staff, and now a dear and valued colleague) for his help in compiling this record of English work abroad.

CURRENT SALES OF GAS PRODUCTS.

[We have discontinued the reports from "A Market Correspondent." A statement as to the reasons for this will be found in our editorial columns to-day.]

The London Market for Tar, Tar Products, and Sulphate.

London, *March* 29.

Pitch continues in demand, and the price remains firm in the neighbourhood of 190s. per ton f.o.b. makers' works. Creosote is a steady market at about 10d. per gallon net. Solvent naphtha and other tar spirits are quiet, and without change. In other products there is nothing fresh to report.

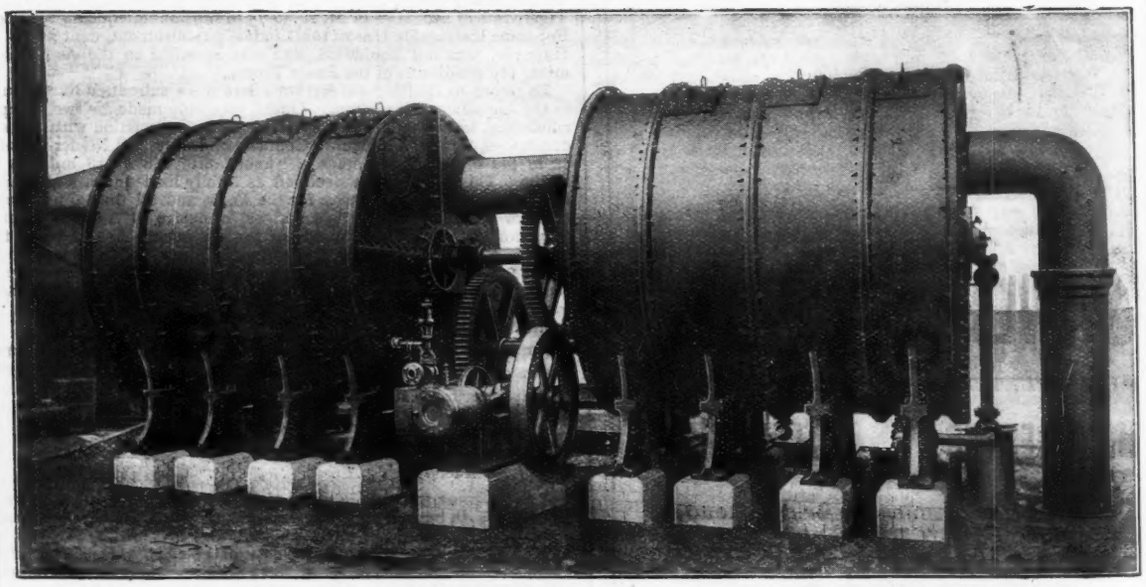
Tar Products in the Provinces.

April 3.

The average values for gas-works products during last week were: Gas-works coal tar, 115s. to 120s. Pitch, East Coast, 185s. to 190s. f.o.b. West Coast—Manchester, 180s. to 185s.; Liverpool, 181s. to 186s.; Clyde, 182s. 6d. to 187s. 6d. Benzole 90 p.ct., North, 1s. 6d. to 1s. 6½d.; crude 65 p.ct. at 120° C., 1s. to 1s. 0½d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 8d. to 1s. 8½d. Toluole, naked, North, 1s. 11d. to 2s. nominal. Coal tar crude naphtha in bulk, North, 8½d. to 9d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 10d. Heavy naphtha, North, 1s. 6d. to 1s. 8d. Creosote, in bulk, North, liquid, 8½d. to 8¾d.; salty, 7½d. to 8d. Scotland, 7d. to 7½d. Heavy oils, in bulk, North, 7d. to 7½d. Carbolic acid, 60 p.ct., 4s. to 4s. 2d. prompt, 3s. 10d. to 4s. forward. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Mr. John Graham Stewart, presiding at the thirty-third ordinary general meeting of Messrs. Stewarts and Lloyds, Ltd., last Wednesday, said the past two years had constituted one of the most trying periods ever experienced by the iron and steel trades of this country; and he was gratified that, at the end of this period—during which the Company had been able, not only to pay a 12½ p.ct. dividend, but also to put aside ample sums to reserve—the Directors were in a position that day to lay before the shareholders a sound and satisfactory balance-sheet. Considerable sums of money were being expended on improving and extending the plant at the works; these extensions being directed to giving them the best type of economical and effective plant. The report and accounts for 1922 were adopted; the dividends and bonus recommended were declared; and it was agreed that £100,000 be placed to reserve, £10,000 to the employees' benefit reserve, and £150,132 carried forward.

ROTARY SCRUBBER WASHERS



MADE TO SUIT ALL REQUIREMENTS. LATEST IMPROVEMENTS.

R. & J. DEMPSTER, LTD., MANCHESTER.

LONDON OFFICE: 34, VICTORIA STREET, WESTMINSTER, S.W. 1.

STOCK MARKET REPORT.

THE Stock Exchange had a rather unusual week crowded into the short four-day period. On Monday and Tuesday things grew quieter and quieter to welcome the holidays, and prices, even in the most gilt-edged, weakened. But on Wednesday there was a sudden revival—buyers came in to secure the good things before the House shut. Many markets made recoveries, and were strong and active to the last. Home Governments were steady, and Colonials and Indians improved. Home Rails were in great demand. In the Foreign Market, Russian and Turk did well.

Business in the Gas Market was a good deal quieter; but a little interval of inactivity did it no harm, and it will awake unimpaired. The general tone was all that could be desired; all variations being to higher figures. In London stocks, Gas Light ordinary and South Metropolitan 3 p.ct. debenture rose ½ each. In Suburbans and Provincials, Aldershot preference rose 2, Cardiff 6½, and Tynemouth 3. Abroad, European rose ½, and Monte Video 2.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Transactions.
£			p.c.					
131,978	Stk.	Feb. 22	—	5%	Aldershot 5 p.c. max. C.	..	74—79	...
190,492	,,	,,	4	4%	Do. 4 p.c. Pref. .	..	68—73	69—70
1,551,868	,,	Oct. 5	2½	5%	Alliance & Dublin Ord.	59—64	59—62	61¼—62½
374,000	,,	Jan. 11	4	4%	Do. 4 p.c. Deb.	76—79	60—65	...
280,000	5	Oct. 19	7½	4/-	Bombay, Ltd. . . .	5⅛—6⅛	4⅛—5	97/6
100,000	5	Feb. 22	16	8/-	Bournemouth Gas and Water { 5 p.c. .	..	11—12	...
383,110	10	,,	7	7/-	Bournemouth Gas and Water { B 7 p.c. .	15—15½	11—12	...
115,000	10	,,	6	6/-	Bournemouth Gas and Water { Pref. 6 p.c.	13½—14	9—10	...
162,065	—	Dec. 29	—	4%	Bournemouth Gas and Water { 4 p.c. Deb.	..	71—76	...
992,045	Stk.	Feb. 22	14	6t/-	Brentford A Consolid. .	261—266	95—98	96½—97½
734,920	,,	,,	11	6t/3	Do. B New . .	204—209	95—98	96½—97½
55,000	,,	,,	5	5%	Do. 5 p.c. Pref. .	109—111	85—90	...
221,400	,,	Dec. 14	4	4%	Do. 4 p.c. Deb. .	91—93	75—80	...
214,775	,,	Mar. 8	11	11⅛%	Brighton & Hove Orig. .	208—213	163—168	164
244,200	,,	,,	8	8⅛%	Do. A Ord. Stk.	154—159	117—122	119½
1,272,500	Stk.	Feb. 22	5	5%	Bristol 5 p.c. max. . .	..	89—92	91½
570,000	20	Mar. 22	12½	20/-	British	44—45	38—40*	...
10,000	10	Dec. 29	—	7/-	Do. 7 p.c. Pref. . .	..	12—13	...
120,000	Stk.	June 29	4	4%	Do. 4 p.c. Deb. Stk.	88—90	75—80	...
280,335	,,	Dec. 29	4	4%	Buenos Aires 4 p.c. Deb.	85—87	55—58	...
100,000	10	Nov. 2	—	—	Cape Town & Dis., Ltd.	1⅛—2⅛	6½—7½	...
100,000	10	Oct. 19	—	—	Do. 4½ p.c. Pref.	4—6	6—7	...
100,000	Stk.	Dec. 29	4½	—	Do. 4½ p.c. Deb. Stk.	70—75	72—77	...
237,860	,,	,,	—	7½%	Cardiff 7½ p.c. Deb. .	..	107—112	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord. . .	108—110	..	...
1,513,280	,,	Mar. 8	5/9/4	60/-	Commercial 4 p.c. Stk.	106—108	92—95	...
560,000	,,	,,	5⅛	60/-	Do. 3½ p.c. do.	103—105	92—95	...
475,000	,,	Dec. 14	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	55—60	...
800,000	,,	Dec. 15	4	—	Continental Union, Ltd.	76—79	25—30	26½
200,000	,,	Dec. 14	7	4%	Do. 7 p.c. Pref.	115—118	55—60	...
660,000		Mar. 8	—	6%	Croydon sliding scale. .	..	100—103	...
284,975		,,	—	5%	Do. max. div. . .	..	82—85	...
492,270	Stk.	,,	6	4⅛%	Derby Con. Stk. . . .	123—125	..	...
55,000	,,	—	4	4%	Do. Deb. Stk. .	102—104	..	...
209,000	,,	Oct. 5	—	5%	East Hull 5 p.c. max. .	..	..	...
2,002,180	10	Jan. 25	10	5/0	European, Ltd. . . .	17½—18	8½—9½	8½—8⅝
16,546,120	Stk.	Feb. 8	4/17/4	52/-	Gas Light and Coke { 4 p.c. Ord . .	92—102	93½—95½	94—95
2,600,000	,,	,,	3½	35/-	Gas Light and Coke { 5½ p.c. max. .	76—79	64—66	65½—65½
4,062,235	,,	,,	4	4%	Gas Light and Coke { 4 p.c. Con. Pref.	96—99	78—80	79½—80
4,761,930	,,	Dec. 14	3	3%	Gas Light and Coke { 3 p.c. Con. Deb.	72½—74½	60—63	61—62
130,000	,,	Dec. 11	10	10%	Gas Light and Coke { 10 p.c. Bonds	..	..	...
—	—	—	—	—	Gas Light and Coke { 7½ p.c. Ilford Deb	..	..	...
82,500	,,	Mar. 8	5	65/7½	Hastings & St. L. 5 p.c.	..	92—97	...
258,740	,,	,,	3½	50/7½	Do. 3½ p.c.	87—89	75—78	...
70,000	10	May 18	11	7½%	Hongkong & China, Ltd.	16½—16⅝	6—7	...
86,600	Stk.	Mar. 8	9	9½%	Hornsey 7 p.c. . . .	..	135—140	...
1,976,000	,,	Nov. 16	9	£5	Imperial Continental .	150—160	160—165	161½—164
404,800	,,	Feb. 8	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	75—78	...
235,242	,,	Mar. 8	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	93—98	...
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. .	..	..	...
600,000	,,	Mar. 22	—	7%	,, 7 p.c. Pref. .	..	102—104*	...
165,736	,,	Feb. 22	7/5/6	80/-	Maidstone 5 p.c. . .	..	107—112	109
63,480	,,	Dec. 29	—	3%	Do. 3 p.c. Deb . .	..	53—58	...
75,000	5	June 29	6	6%	Malta & Mediterranean Met. of Melbourne { 4½ p.c. Deb.	4⅛—4⅜	3⅛—3⅜	...
100,000	100	Oct. 2	4½	4½%	Monte Video, Ltd. . .	99—101	97—100	...
541,920	Stk.	Nov. 30	4	4%	Newcastle & Gatsh'd Con.	11½—12	52—57	...
1,875,892	,,	Feb. 22	4½	5⅛%	Do. 4 p.c. Pref. Stk.	98½—99½	79½—80½	...
250,166	,,	,,	—	4%	Do. 3½ p.c. Deb.	..	76—78	...
529,705	,,	Dec. 29	3½	3½%	North Middlesex 10 p.c.	82—83	68—69	...
15,000	10	Aug. 26	—	7/6	Oriental, Ltd. . . .	..	..	...
55,940	10	Mar. 8	7/14/0	7/8⅜	,, 7 p.c.	14—15	10½—11½	...
300,000	Stk.	Nov. 30	8	8%	Plym'th & Stonh'se 5 p.c.	117—122	97—102	98½—100
188,120	Stk.	Dec. 29	—	72/6	Portsea Island, B . .	..	94—99	...
60,000	50	Mar. 8	13	65/-	Do. C . . .	128—131	98—103	...
100,000	50	,,	12	60/-	Primitiva Ord. . . .	118—121	95—102	...
290,069	5	—	8	—	Do. 5 p.c. Pref. .	5⅛—6	1⅛—1⅜	12/-
499,960	5	—	5	—	Do. 4 p.c. Deb. .	4⅛—5	1⅛—2⅛	38/—39/-
521,600	100	Nov. 30	4	4%	Do. ,, ,, 1911	91—93	70—73	...
600,000	Stk.	Jan. 25	4	4%	River Plate 4 p.c. Deb.	85—87	55—58	55½—56
346,198	,,	Dec. 29	4	4%	San Paulo { 6 p.c. Pref.	10⅛—11	5⅛—6*	...
150,000	10	Mar. 22	6	6/-	San Paulo { 5 p.c. Deb.	47—49	36—38	...
125,000	50	July 3	5	5%	Sheffield A	223—224	93—96*	...
135,000	Stk.	Mar. 22	10	5%	Do. B	222—224	93—96*	...
209,984	,,	,,	10	5%	Do. C	220—222	93—96*	...
525,500	,,	,,	10	5%	Shrewsbury 5 p.c. . .	..	..	...
133,201	Stk.	Sept. 15	4	4%	South African . . .	10⅛—11⅛	7—9	...
90,000	10	Nov. 2	9	7%	South Met. Ord. . . .	111—113	94—96	94⅛—95⅛
6,609,895	Stk.	Feb. 22	5/4/0	60/-	Do. Red. Pref. .	..	95—97	96⅛
250,000	,,	Jan. 11	—	5%	Do. 3 p.c. Deb. .	72⅛—74⅛	68—82	60½—61½
1,895,445	,,	,,	3	3%	Do. 6½ p.c. Deb.	..	104—106	106
734,000	,,	Mar. 8	—	6⅛%	South Shields Con. Stk.	157—159	115—117	...
92,500	,,	Feb. 22	8½	8½%	S'th Suburb'n Ord. 5 p.c.	114—116	98—101	98½—100
1,087,795	,,	,,	6	6%	Do. 5 p.c. Deb. Stk.	116—118	93—98	98
368,837	,,	Dec. 29	5	5%	Southampton Ord. . .	99—102	84—87	...
647,740	,,	Nov. 2	5	7%	Do. 4 p.c. Deb. Stk.	..	68—73	...
121,275	,,	Dec. 29	4	4%	Swansea 7 p.c. Pref. Stk.	..	102—104	...
250,000	,,	Mar. 8	—	70/-	Do. 6½ p.c. Deb. Stk.	..	102—104	...
200,000	,,	Dec. 29	—	6½%	Tottenham District { A 5 p.c. .	135—138	109—114	...
120,000	,,	Feb. 22	—	7½%	Tottenham District { B 3½ p.c. .	115—117	100—103	100
782,275	,,	,,	6	6%	Tottenham District { 4 p.c. Deb.	87—89	75—80	...
181,255	,,	Dec. 14	4	4%	Tynemouth 5 p.c. max.	108½—109	87—89*	...
258,251	Stk.	Mar. 22	5	5%	Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Feb. 22	8½	87/6	Wandsworth A 5 p.c. .	151—156	125—130	...
255,636	,,	,,	6½	72/6	Do. B 3½ p.c. .	129—134	112—117	114
108,075	,,	,,	—	61/3	Do. C. . . .	..	97—102	...
140,865	,,	,,	—	61/3	New Ordinary . . .	..	97—102	...
352,000	,,	,,	6½	68/9	Wimbledon 5 p.c. . .	117—122	107—112	...
98,000	,,	,,	6½	73/9	Epsom 5 p.c. . . .	121—126	110—115	...
88,416	,,	Dec. 29	3	3%	3 p.c Deb. Stk. .	66—69	56—59	...

*Ex Div.

The following transactions in gas during the week were recorded: On Monday, Alliance and Dublin 61⅜, 62¼, Brentford "A" 96½, Bristol 91½, Continental Union 26½, European 8⅜, Gas Light ordinary 94, 94⅛, 94¼, 94⅜, 94½, 94⅝, 94¾, ditto 3½ p.ct. maximum 65¼, 65⅜, ditto 4 p.ct. preference 79¼, ditto 3 p.ct. debenture 61½, 62, Imperial Continental 161, 161½ 163½, Maidstone 109, Primitiva 5 p.ct. preference 38s., 38s. 3d., South Metropolitan 94½, 94⅝, 94⅝, 95⅛, 95⅛, ditto 3 p.ct. debenture 60⅛, 61½, ditto 6½ p.ct. debenture 106, South Suburban 100, ditto 5 p.ct. debenture 98, Tottenham "B" 100, Aldershot 5 p.ct. "A" 88½, Brighton and Hove 5 p.ct. debenture 76, British (Hull) 3½ p.ct. debenture 63, 63½, Folkestone 80½, 81, Lea Bridge 5 p.ct. preference 90, 90½. On Tuesday, Alliance and Dublin 61½, 62, Brentford "B" 96⅝, 97½, European 8½, 8 11/16, 8⅝, Gas Light ordinary 94, 94⅛, 94⅜, 94½, 94⅝, 94⅞, ditto 4 p.ct. preference 79⅝, ditto 3 p.ct. debenture 61, Imperial Continental 161½, 162, Oriental 98½, Primitiva 118., ditto 5 p.ct. preference 39s., South Metropolitan 95⅛, 95½, ditto 3 p.ct. debenture 61½, South Suburban 98⅜, 99½, 100, Wandsworth "B" 114, Brighton and Hove 5 p.ct. debenture 94, Woking district 5 p.ct. "C" preference 83, Worthing consolidated 79, 79⅝. On Thursday, Aldershot 4 p.ct. preference 69, 70, Brentford "A" 97½, Brighton and Hove original 164, European 8½, Gas Light ordinary 94, 94⅛, 94⅝, 95, ditto 4 p.ct. preference 80, ditto 3 p.ct. debenture 61½, Imperial Continental 164, Primitiva 5 p.ct. preference 39s., South Metropolitan 94⅝, 95, 95½, 95⅝, 95⅞, ditto 5 p.ct. preference 96½, ditto 6½ p.ct. debenture 106, Southgate and District 5 p.ct. preference 87½, Worthing 79⅛, Tynemouth 9.

In the Money Market, conditions were variable; opening very firm, then easing materially for a couple of days, and finally closing with a considerable demand. However, supplies being ample, there was no awkward pressure. Discount rates kept fairly steady. Silver eased slightly, closing at 32⅝d. The Bank of England rate was 3 p.ct., as fixed on July 13.

GASHOLDER AND TANK CONSTRUCTION AT THE SUTTON GAS-WORKS.

1,000,000 cubic feet capacity.

By F. SOUTHWELL CRIPPS.

Price 10/6 net.

WALTER KING, LTD., "GAS JOURNAL," OFFICES, No. 11, Bolt Court, FLEET STREET, E.C. 4.

Demy 4to. Limp Cloth. Price 10s. 6d.

THE FLOW OF GASES and PROPORTIONING GAS MAINS.

By

F. SOUTHWELL CRIPPS, Assoc.M.Inst.C.E.

WALTER KING, LTD., "GAS JOURNAL" OFFICES, No. 11, Bolt Court, FLEET STREET, E.C.4.

THE NORTH-EAST COAST COAL TRADE.

From Our Own Correspondent.

There is little or no change to report in the market during the last week, and business always tends to be slack here when holidays are about.

Inquiries were circulating at the beginning of the week for 50,000 tons of steam coal for the German State Railways, for delivery over the next two months. In the present sold-out condition of the market for that period, it is doubtful whether the order will come to Newcastle. Though this perhaps gave the market a feeling of renewed strength, it is doubtful whether the undertone is really quite as strong as it has been. In spite of the acute shortage, and colliery quotations of 35s. for best gas, buyers are not so eager to pay just any price as they were a few weeks back. There has been an instance this week of a cargo of this kind, previously sold for Germany, coming back on the market at 35s. without a buyer at that price.

However, collieries are well enough sold up to the end of June to enable them to ask good prices for any odd cargoes they may have to dispose of, and they can still afford to wait and see what turns up after that before making any substantial concessions.

The market is certain to continue quiet for the week following the holidays. Quotations for gas are from 30s. to 32s. 6d. for seconds, up to 35s. for bests and Wear specials.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From a Local Correspondent.

Great quantities of coal are being exported from both Yorkshire and Lancashire; and there is considerable congestion at the ports in consequence. Exporters at Hull and Goole are complaining that the railway companies cannot cope with the traffic, and several firms report that they are unable to guarantee the loading of cargoes until after the holidays. This congestion at the ports has also interfered to some extent with the full working of the collieries, and has caused a realization of fuel in second hands. This caused values to weaken for prompt sale; but the colliery position is little altered regarding values. Best large steams are still quoted 32s. to 33s. per ton f.o.b., and secondary grades are offering at rather lower rates than a week ago. In view of the holidays there has been more pressure for fuel; the railway companies taking a larger supply to maintain the reserve stocks. Home consumption, too, is heavier, and a good tonnage is being taken for bunker use. The pressure for all kinds of washed steam fuel is brisk, and adequate supplies are difficult to obtain. Washed doubles and singles are quoted up to 33s. per ton f.o.b., and smithy peas up to 34s. Dry smalls are in active demand; and the difficulty of obtaining a sufficient supply of good coking slacks continues. The output of furnace coke has been augmented; but it is still insufficient for the demand. Home supplies are more satisfactory, and values are from 60s. to 65s. per ton f.o.b. In the retail trade, merchants report that they are not in urgent need of fuel owing to the mildness of the weather; and the industrial position is unchanged from that of a week ago.

COAL TRADE IN THE MIDLANDS.

From Our Local Correspondent.

The steps reported last week for securing a revision of contract prices for gas coal over the March-June quarter at the instance of certain collieries have resulted in some adjustments. Before the new quarter was entered upon, other collieries notified their customers that, in the circumstances which have arisen, they would exercise their right to reopen the question. It is understood, however, that in a considerable number of cases no claim has been made in this connection, so that contracts will remain on the original basis till their period expires. The movement has come mainly from the Derbyshire district. Terms have been agreed upon which will not involve any very great increase in the cost of producing gas; nevertheless it is very disappointing to managements that there should be any check to the decline of the curve. They had hoped that the worst of their troubles were over. A considerable measure of success has attended their efforts to restore a sound equilibrium in the industry; and the altered position of the market causes uneasiness. The opinion is still widely held that the alteration is more apparent than real, and buyers in this area think there is a good chance of prices settling again before the time comes for arranging the yearly contracts. While there is no perceptible easing of the coke stringency, hopes are entertained that accumulations of coke with which lines of communication to the ports are blocked may become available for the home trade.

Colchester Gas Company.

Moving the adoption of the report for the year 1922 at the recent meeting, the Chairman (Mr. W. Gurney Benham) said that it was a very favourable one, both as to performance and as to promise. The dividends proposed—at the rate of 12¾ p.ct. per annum on the "A" shares and £8 18s. 6d. on the "B" shares—were less than the maximum which was permissible under the sliding-scale. The Directors might have divided a somewhat larger proportion of the profit; but they felt that it was in the interest of the shareholders to conserve and consolidate the financial position of the Company. Referring to the new machinery and carbonizing plant (to which the report stated the satisfactory results were chiefly due), he remarked that this had now all been paid for. The price of gas had been reduced twice during the year; and not only had a good supply been maintained, of a quality exceeding the declared figure, but the Company had instituted a good deal of free work in regard to maintenance and upkeep of consumers' appliances, in order to add to the efficiency of the service. He was expressing the feelings of the entire Board when he declared that the excellent results in increased efficiency and in economical working, were most creditable to their Engineer and Manager, Mr. W. W. Townsend, whose services, in the practical reconstruction of the works, at a difficult period, and under many disadvantages, entitled him to the thanks of the shareholders and of the town. Mr. W. English (the Secretary) had, with the remainder of the staff, co-operated most loyally and effectively in securing the good results which had been obtained.

Leamington Priors Gas Company.

The past half-year was described as a comparatively tranquil one by the Chairman (Dr. T. W. Thursfield, J.P.) at the 116th ordinary general meeting of the Company. The working for 1922 had been satisfactory. Coal prices had been reduced to a fairly reasonable level when contracts were made last summer, and the price of gas had therefore been lowered after the Michaelmas quarter to 10d. per therm, equivalent to 4s. per 1000 c.ft. Though there had been a slight falling-off in the quantity of gas sold during the past six months, he was hopeful that, with improving trade, they would more than make this up. As a step towards it, they had arranged to extend the mains into Bishops Tachbrook, and to couple-up the mains in Cubbington. He had always advocated going into the surrounding villages, considering this a good policy, and advantageous both to the inhabitants and to the Company. Incidentally, these two extensions would find employment for a considerable number of men during the spring. It was gratifying to find a steady increase in the number of employees holding either shares or debenture stock in the Company. The report and accounts were adopted, and the payment of the statutory dividends agreed to. The Chairman, Directors, General Manager and Engineer (Mr. R. S. Ramsden), Secretary (Mr. W. E. T. Hems), staff, and employees were heartily thanked for their services. In reply, Dr. Thursfield remarked that the Directors were obtaining advice on their superannuation scheme, which would help all the employees towards providing for old age; and with the same object in view, he recommended them all to become shareholders and part owners in the undertaking.

Reduced Price at Retford.—At the last meeting of the Retford Town Council, the Chairman of the Gas Committee (Alderman Thornton) announced a reduction in the price of gas of 6d. per 1000 c.ft., from 4s. 4d. to 3s. 10d.

A Good Year at Bradford.—The annual financial statements of the various Bradford Corporation trading departments, up to the end of March, are not yet officially issued; but it has been ascertained in a general way that the gas department have experienced a particularly good year—so good, indeed, that the deficit of £8000 of last year has been wiped out, and there will be a small surplus.

Dartmouth Gas Company.—At the annual meeting of the Company, Mr. H. Adams presiding, dividends were declared of 5 p.ct. on the second preference shares and 10 p.ct. on the ordinary shares, less income-tax. The sum of £400 was placed to the reserve fund and £1221 carried forward. The profit was £2518. Mr. J. B. Cattle (the Managing Director) was congratulated on the results attained.

Exmouth Gas Company.—The Rev. C. R. Carr presided at the annual meeting of the Company, when the accounts were adopted. The Chairman said the recommendation of a dividend of 7 p.ct., less income-tax, should give pleasure to the shareholders. It was a better return on their capital than they had had for some years. Mr. L. D. Thomas seconded, and referred to the new machinery installed at the works and to the progressive policy of the Manager (Mr. W. E. Dean). The Directors have decided to reduce the price of gas to 11d. per therm from Lady Day.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON TUESDAY, to ensure insertion in the following day's issue.

Orders to Alter or Stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Monday.

UNDISPLAYED ADVERTISEMENTS; Situations Wanted, Six Lines and under (about 36 words) 3s.; each additional Line, 6d. Situations Vacant, Apparatus Wanted and for Sale, Contracts, Public Notices, &c., 9d. per Line—minimum, 4s. 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

		ONE YEAR.		HALF-YEAR.		QUARTER.
United Kingdom	Advance Rate:	35/-	..	18/-	..	10/-
	Credit Rate:	40/-	..	21/-	..	11/6
Abroad (In the Posta Union) Payable in Advance		40/-	..	22/6	..	12/6

In payment of subscriptions for "JOURNALS" sent abroad, Post Office Orders or Bankers' Drafts on London only are accepted.

All Communications, Remittances, &c., to be addressed to WALTER KING, LIMITED, 11, BOLT COURT, FLEET STREET, LONDON, E.C. 4.

Telegrams: "GASKING, FLEET LONDON." Telephone: Holborn 6857.

OXIDE OF IRON

FOR SALE OUTRIGHT, OR ON LOAN.

SPENT OXIDE

PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LTD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.2.

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for Gas-Works.
ANDREW STEPHENSON, Gresham House, Old Broad Street, LONDON, E.C. "Volcanism, London."

E. J. COSSEY & CO.

CONTRACTORS for "Trafford" Tiles and other Asbestos-Cement Roofings—Fixing Contracts undertaken. Gas Works Stores Merchants.
3, CURSITOR STREET, CHANCERY LANE, LONDON, E.C.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR (SATURATORS), LTD., Chemical Plant Engineers, Blackhorse Street Mills, BOLTON.
Telegrams—"SATURATORS, BOLTON." Telephone 848.

CORRESPONDENCE TUITION in GAS ENGINEERING for City and Guilds Institute Exams. (Preliminary and Final). Successful Results. Low Fees.
PENNINGTONS ENGINEERING TUTORS, 254, Oxford Road, MANCHESTER.

SPENCER'S Patent Inclined **HURDLE GRIDS.**

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, March 21, p. 792.

GEORGE WILSON GAS METERS, Ltd.
for
GAS-METERS, ORDINARIES, SLOTS, AND REPAIRS,
Foleshill Road, COVENTRY.
Telephone: 596. Telegrams: "GASMETER,"
and at 238, Stockport Road, MANCHESTER.
Telephone: RUSHOLME 976. Telegrams: "GASMETER,"
and 46 & 47, Auckland Street, LONDON, S.E. 11.
Telephone: HOP 647. Telegrams: "GASEOUS LAMB."

SULPHURIC ACID.

SPECIALLY prepared for the manu- facture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.
36, Mark Lane, LONDON, E.C. Works—SILVERTOWN.
Telegrams—"HYDROCHLORIC, FEN, LONDON."
Telephone—MINORIES 1166.

TULLY GAS PLANTS, LTD.,
MILLGATE, NEWARK-ON-TRENT.
SOLE Makers of Tully's Patent Gasi- FICATION PLANT. Specialists in Tar Extractors, Coal Elevators and Conveyors, Hoppers, Bunkers, T.G.P. Fire Cement, Castings.
Telegraphic Address: "DAMPER, NEWARK."
Telephone No.: 174 NEWARK.

MEWBURN, ELLIS, & CO.,
CHARTERED PATENT AGENTS AND
TRADE MARK AGENTS,
70 & 72, Chancery Lane, London, W.C.2.
Telegrams: "Patent, London." Phone 243 Holborn.
And 3, St. Nicholas Buildings, Newcastle-on-Tyne.

BRITISH GAS PURIFYING MATERIAL.

ENGLISH BOG ORE AND NATURAL HYDRATED OXIDE OF IRON.
SPENT OXIDE BOUGHT.

BRITISH GAS PURIFYING
MATERIALS CO., LTD.,
ARCADIAN GARDENS, WOOD GREEN, LONDON, N. 22.
Telegrams: "Bripurimat, Wood, London."
'Phone: Palmers Green 608,

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E. 1.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LAMB, LONDON."

WE Specialize in Small Gas-Works and Solicit Inquiries for COMPLETE WORKS, EXTENSIONS, and RENEWALS.
Penney & Porter (Engineers), Ltd.,
LINCOLN.
Established 1855.
Telegrams: Porter, Lincoln. Telephones: 266 & 211.

WANTED.

TAR, Light Oils, Crude Benzole and NAPHTHAS,
For which we are prepared to pay Good Prices.
FREDK. G. HOLMES & CO., LTD.,
THAMES TAR WORKS, NORTHFLEET, KENT.

INVENTIONS PATENTED. TRADE MARKS REGISTERED.
Advice, Handbook and Consultations Free—KINGS PATENT AGENCY, Ltd. (Director, B. T. King, A.I.M.E., British and U.S. Regd. Patent Agent), 146A, QUEEN VICTORIA STREET, LONDON. 36 years' references.

J. E. C. LORD (Manchester), Ltd.,
Ship Canal Tar Works, Weaste, Manchester.
Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

APPOINTMENTS, &c., VACANT.

WHEN Filling Vacancies, please REMEMBER THE CLAIM OF THE EX-SERVICE MAN, who, other Qualifications being equal, has the FIRST CALL ON YOUR CONSIDERATION.

URBAN DISTRICT COUNCIL OF NEWRY.
(GAS DEPARTMENT.)

APPOINTMENT OF CONSULTING ENGINEER.

THE Gas Committee of the above Council require the Services of a COMPETENT GAS ENGINEER TO ADVISE them, as and when required, on all matters relating to the Gas Undertaking, including the Repairing and Improving of the Existing Plant and the Installing of a New Plant.

The Engineer appointed will be required to visit the Gas-Works once annually, in the month of May, for the purpose of making a thorough Examination of the Entire Plant and Reporting to the Committee on the Gas Undertaking Generally, and to Supply a Working Statement, also a comparative statement of the cost of Maintenance, Manufacture, and Distribution of Gas. He will also be required to Advise from time to time as to the existing Methods of Manufacturing and Distributing Gas, and the Production and Treatment of Residuals, with a view to effecting Improvements and having the undertaking conducted on the most up-to-date lines.

Applicants to state Qualifications, References, and Terms, and to name a fee for additional visits if desired by the Committee.

Applications to be addressed to the Chairman of the Gas Committee, Town Hall, Newry, and Delivered (not later than the 11th proximo.

Dated this 27th day of March, 1923.

By order,
THOS. WATT,
Secretary.

Gas Offices,
Kilmorey Street, Newry.

THE GAS LIGHT AND COKE COMPANY.

CHIEF DRAUGHTSMAN.

CHIEF Draughtsman required by the above Company. Candidates must have had First-Class Technical Training and Extensive Experience in the Design of Buildings, Structural Steelwork, and Plant for the Mechanical Handling of Materials. A knowledge of the Construction of Gas-Works Plant and River Walls is also desirable.

Applications, giving full information as to Experience and Qualifications, Age, Salary required, and endorsed "Chief Draughtsman," should be addressed to The CHIEF ENGINEER, The GAS LIGHT AND COKE COMPANY, HORSEFERRY ROAD, LONDON, S.W. 1, on or before the 20th of April.

WANTED, Practical Retort-House FOREMAN for the Montevideo Gas-Works. Must be an Experienced Retort Setter. Free Passage out and home, Three Years' Agreement, Liberal Salary, Free Quarters, 48-Hours Week.

Write, giving full Particulars of Experience, Age, &c., to the LONDON MANAGER AND SECRETARY, Montevideo Gas and Dry Dock Co. Ltd., 321, DASHWOOD HOUSE, NEW BROAD STREET, E.C. 2.

OXIDE OF IRON.

SPENT OXIDE BOUGHT.

BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C.3.
Phone: Minories 1484.

"TORTO" FIRE CEMENT.

BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C.3.
Phone: Minories 1484.

"KLEENOFF," THE COOKER CLEANSER.
Tins for Sale to Consumers.
In Bulk for Works Use.

BALE & CHURCH, LTD.,
33, ST. MARY AT HILL, LONDON, E.C.3.
Phone: Minories 1484.

APPOINTMENTS, &c., WANTED.

TO Gas Engineers and Manufacturers. —Live Representative, well known in England, Ireland, and Scotland, is prepared to consider offers for immediate REPRESENTATION or to Take Over SHOWROOM MANAGERSHIP. Twenty Years' Experience Gas Stove Business.
Address No. 7273, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4.

ENGINEERS Established London THIRTY YEARS DEVELOP Technically and Commercially Sound ENGINEERING IDEAS on MUTUAL BASIS.
Communicate, in first instance, to BOX "E" 466, care of DAWSON'S, 121, CANNON STREET, E.C. 4.

STOCK ISSUES.

By Order of the Directors.

NEW ISSUE OF DEBENTURE, PREFERENCE, AND ORDINARY CAPITAL.

UXBRIDGE, WYCOMBE AND DISTRICT GAS COMPANY.

MESSRS. A. & W. RICHARDS
are Instructed to offer
FOR SALE BY TENDER
£60,000 NEW CAPITAL,
Comprising
£30,000 FOUR-AND-HALF PER CENT. PERPETUAL DEBENTURE STOCK
at the Minimum Price of £85 per £100, yielding £5 5s. 11d. per cent.
£15,000 FIVE-AND-HALF PER CENT. PREFERENCE STOCK (PERPETUAL),
at the Minimum Price of Par, yielding £5 10s. 0d. per cent.
£15,000 ORDINARY STOCK,
ranking equally with the existing similar Stock, now receiving £6 5s. 0d. per cent., and
at the Minimum Price of £95 per £100, yielding £6 11s. 7d. per cent.

	£	s.	d.
The net revenue of the Company for the year ended 31st December, 1922, was	17,877	9	5
The interest on the Loan Capital, including the Debenture Stock being issued, will amount to	3,150	15	0
	£14,726	14	5
The dividends on the Preference Stock, including that now offered, will require	4,241	10	0
Leaving available for dividends on the Ordinary Stock	£10,485	4	5

The dividends on the Ordinary Stock for the year ended 31st December last were paid at the rate of 5½ per cent. per annum in respect of the six months ended 30th June, and of 6½ per cent. per annum in respect of the six months ended 31st December.

The accumulated funds of the Company, viz., Reserve, Special Purposes, Depreciation and Undivided Profit brought forward after payment of the December dividends amount to £22,408 13s. 10d.

The Ordinary Stock ranks for a Standard Dividend of 5 per cent., subject to the Sliding-Scale, the standard price of gas being 1s. 6½d. per therm and the slide operating by 2s. 6d. per cent. per annum for each variation of ½d. per therm above or below the standard price. During the half-year ended 31st December last the selling price was 16·1d. per therm, the corresponding dividend being £6 7s. 6d. per cent. per annum, but the Directors recommended the payment of £6 5s. 0d. per cent. per annum only. As from the 1st January last the selling price was reduced to 15d. per therm.

The Company was established in 1854 as the Uxbridge and Hillingdon Gas Consumers Company, and was incorporated by Special Act of Parliament in 1861. Further powers have been obtained in subsequent years, which included authority to acquire the Undertakings of the High Wycombe, Eton, and Great Marlow Gas Companies.

The statutory area of the combined undertakings now covers about 197 square miles, and includes Uxbridge, Hillingdon, Hayes, Harlington, West Drayton, Yiewsley, Coinbrook, Wyrardisbury, Datchet (part), Eton, Ivor, Stoke Poges (part), Fulmer, Denham, Gerrards Cross, the Chalfonts, Beaconsfield, Great Marlow, High Wycombe, Hughenden, Penn, Amersham, Great and Little Missenden, Chenies, Flaunden, and Sarratt.

The Company supplies through its 159 miles of mains 16,865 consumers; and the sales of gas last year were 1,748,381 therms, equivalent to 380 million cubic feet.

Prospectus and Forms of Tender, which latter must be sent in by 11 o'clock on Wednesday, 11th April, may be obtained of Messrs. A. & W. RICHARDS, 37, WALBROOK, E.C. 4.

ROBERT DEMPSTER & SONS, Ltd., ELLAND, Builders of CARBONIZING PLANTS, both Horizontal and Vertical. Manufacturers of CONDENSERS, PURIFIERS, GASHOLDERS, &c., also every description of COAL and COKE HANDLING PLANT. Telegrams: "DEMPSTER, ELLAND." Telephone: ELLAND 261 (Private Branch Exchange).

EXTENSIONS and Renewals. Ask us to quote before ordering GAS APPARATUS, COKE-OVEN PLANT, STRUCTURAL STEELWORK. Competitive prices, First Class Workmanship. Satisfaction Guaranteed.
FIRTH BLAKELEY, SONS, & Co., LTD., CHURCH FENTON, YORKSHIRE.

PLANT, &c., FOR SALE & WANTED

GAS Plant at Bargain Prices:
½ RETORT SETTINGS—4 Complete Modern Beds, 6's, 21 by 15 ○, also Beds of 8.
CONDENSERS—Sets ANNULAR, 10 in., 12 in., 14 in., and Set WATER-TUBE, 14 in. Valves.
BLAKELEY'S New Patent Baffle Plate CONDENSERS. 3 Sets 8 in., 10 in., and 12 in.
TOWER SCRUBBERS, 5 by 40, 5 by 28, 4½ by 36, 3½ by 25, 4 by 14, complete.
LIVESEY WASHERS, ¾ and ½ Million, and 100,000.
PURIFIERS—Sets of 25 ft., 20 ft., 12 ft., 9 ft., and 8 ft.
EXHAUSTERS and ENGINES, 60,000, 40,000, 20,000, 15,000, 5000, and smaller.
GASHOLDERS and STEEL TANKS, 5000 to 100,000.
Boilers, Engines, Pumps, Tanks, and all Accessories.
FIRTH BLAKELEY, SONS, AND CO., LTD., CHURCH FENTON, YORKS.

RAILWAY Tank Wagons for Disposal, Rectangular and Cylindrical, especially suitable for Oil and Acids. Inquiries invited.
BROTHERTON & Co., LTD., LEEDS.

LLANDUDNO URBAN DISTRICT COUNCIL.
FOR SALE—Cornish Boiler, 14 ft. by 5 ft., Meldrum Forced Draught, Mountings, &c., complete. Insured Working Pressure, 80 lbs.
Address the MANAGER, GAS-WORKS, LLANDUDNO.

STEAM-BOILERS—All Sizes, Vertical, Loco-type, Cornish, Portable, and Other Types of Boilers, for SALE.
Apply GRANTHAM BOILER & CRANK Co., LTD., GRANTHAM.

VALVES and Taps, 20 in. to 3 in., various makes, New and Overhauled, Large Stock ready for Delivery; also BRASS VALVES, TAPS, and GAUGES. FIRTH BLAKELEY, SONS, & Co., LTD., CHURCH FENTON, YORKS.

FOR SALE—Equal to New.
1 Gasholder and Steel Tank—20,000 c.ft. capacity.
1 Gasholder and Steel Tank—11,000 c.ft. capacity.
1 Gasholder and Steel Tank—9,000 c.ft. capacity.
1 Steel Tank 31 ft. 6 in. by 15 ft. 3 in. deep.
1 Steel Tank 29 ft. 6 in. by 12 ft. 3 in. deep.
J. BATES & SONS, Gas Engineers, WIGSTON LANE, AYLESTONE, LEICESTER.

FOR SALE—Surplus Test Room APPARATUS.
One Alexander Wright BAROMETER in Case.
Three 5-cubic feet Alexander Wright TEST GAS METERS.
One HARCOURT STANDARD LAMP.
One FLICKER PHOTOMETER HEAD.
One KING'S GAUGE (Repaired).
Can be seen by Appointment.
The TILLEY HIGH PRESSURE GAS SYNDICATE, LTD., BRENT WORKS, HENDON, N.W. 4.

PURIFIERS, one Set of 4, nearly new, 12 ft. square, 5 ft. deep, Rubber-Jointed Covers, with 14 in. patent Valve and Connections, Lifting Gear, and Iron-Slated Roof. All modern and perfect. Cheap. Plan on Application to No. 7277, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4.

WILTON'S Tar Dehydrating Plant, 100 gallons per Hour capacity. Complete Stills, Coils, Economizer, Condensers. Cheap. Plan Supplied. Apply No. 7278, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4.

TWO Gas Purifiers, 30 ft. by 25 ft. by 5 ft. deep, water lutes 2 ft. 6 in. deep, 26 in. Four-Way Weck's Valve. Perfect condition. Bargain price to clear. Apply No. 7279, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4.

FOR SALE—400-Light Gas-Meter, by Messrs. Parkinson and W. & B. Cowan, Ltd., No. 990,562. In perfect Condition. Been very little used.
Apply, T. BALMFORTH & Co., LTD., LUTON.

PURIFIERS FOR SALE—Set of Four, 10 ft. square, Complete with Centre Valve 10 in. dia. Connections, complete with Lifting Gear.
For further Particulars, apply to the MANAGER, GAS-WORKS, BURY ST. EDMUNDS.

PURIFIERS AND WASHER.
WANTED — Set of Second-Hand 15 ft. or 16 ft. PURIFIERS, Complete, in Good Condition; also "Livesey" WASHER, 6 in., 7 in., or 8 in. Connections.
Full Particulars to the SECRETARY, CEFN GAS COMPANY, LTD., ACREFAIR, RUABON.

CONTRACTS OPEN.

BANGOR (CO. DOWN) URBAN DISTRICT COUNCIL.

NEW GASHOLDER.

THE above Council invite Tenders for the Supply and Erection, according to Plan and Specification prepared by Mr. Barker Mitchell, the Council's Gas Engineer, of a THREE-LIFT SPIRAL GUIDED GASHOLDER, STEEL TANK, and CONNECTIONS, at their Works at Bangor, co. Down.
Plan and Specification can be had from Mr. Mitchell on deposit of Five Pounds (£5), which will be returned on the receipt by me of a *bona fide* Tender.
Tenders will be received at this Office up to Thursday, the 26th of April, 1923.
The Council do not bind themselves to accept the lowest or any Tender.

J. MILLIKEN,
Clerk to the Council.

Town Hall, Bangor,
co. Down,
March 23, 1923.

HOLME CULTRAM URBAN DISTRICT COUNCIL.

THE Silloth Gas Committee of the above-named Council are prepared to receive TENDERS for a GASHOLDER and STEEL TANK to be erected at their Gas-Works, Silloth.
Drawing and Specification may be seen on Application to Mr. Herbert Lees, Assoc.M.Inst.C.E., Gas Office, Hexham.
Tenders, endorsed "Tender for Gasholder," to be forwarded to the undersigned not later than the 21st of April, 1923.
The lowest or any Tender not necessarily accepted.
By order,
JAMES SHIEL,
Clerk to the Silloth Gas Committee.

Continued on p. 56.

Now Ready

DESIGN and CONSTRUCTION
of a
12½ MILLION GASHOLDER

By R. J. Milbourne, Assoc.M.Inst.C.E., F.C.S.

The work comprised in the pages of this Book was first published as a series of articles in the "GAS JOURNAL," when it met with so much appreciation from the gas engineering fraternity that it was thought advisable to embody it in its present handy form.

Size 7 in. by 9 in., Bound in Cloth, Gilt Lettered, with numerous illustrations in the text, and seven double page plates.

Price 7s. 6d.

Walter King, Ltd., "GAS JOURNAL" Offices, 11, Bolt Court, Fleet Street, London, E.C. 4.